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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Twenty-ninth Annual Meeting, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
NEW ALBANY, IND., March 21st, 1906.

To the Members of the Western Gas Association: The Twenty-ninth annual meeting of the Western Gas Association will be held in the Hollenden House, Cleveland, O., May 16, 17 and 18, and will be called to order at 10 A.M., by the President, Mr. Paul Doty, of St. Paul, Minn.

The Hollenden, prepared to accommodate 300 guests and furnish a room suitable for the sessions of the Association, announces the following rates. European plan: Rooms with running water, $1.50 and $2; rooms with bath, $2.50, $3, $3.50 and $4; double-bedded rooms with bath, $4 to $5.

The Hollenden, while conducted on the European plan, furnishes meals as follows: Club breakfast—50 cents and upwards; an 8-course lunch for 50, 60 and 75 cents; table d'hote dinner, 65 cents.

The following papers will be presented to the Association:

"Firing of Retort Benches by Battery Producers," by Mr. Fred. Bredel, Milwaukee, Wis.

"Electrolysis of Gas Mains," by Mr. M. R. Bump, Denver, Col.

"The Relation of Gas to Our Modern Life," by Mrs. O. N. Guldlin, Fort Wayne, Ind.

"General Data on Artificial Gas Properties," by Mr. W. E. Steinwedell, Cleveland, O.

"Notes on Carbonization," by Mr. W. E. Hartman, Joliet, Ills.

"Regulation of Rates," by Mr. Geo. McLean, Dubuque, Ia.

"Change in Grade of Mains at Galveston," by Mr. John Gimper, Galveston, Tex.

"Labor Saving Machinery for Medium Sized Retort Houses," by Mr. F. H. Shelton, Philadelphia, Pa.

"The Making of Rates and the Additional Business System of Cost," by Mr. W. H. Gardiner, Jr., Boston, Mass.

"Some Brief Notes on Capacities of Water Gas Sets," by Mr. Rollin Norris, Philadelphia, Pa.

"A Balance between Calorific Value and Candle Power in Water Gas," by Mr. T. D. Miller, New Orleans, La.

"The Utilization of Tar in a Water Gas Apparatus," by Mr. Geo. H. Waring, Omaha, Neb.

"Water Gas Practice," by Mr. D. G. Fisher, St. Louis, Mo.

"Extraction of Tar from Water Gas," by Mr. E. H. Earnshaw, Cincinnati, O.

"The Mutual Advantage to be Derived through Co-operation between Engineering Schools and Those Engaged in the Gas Business," by Prof. Chas. F. Burgess, University of Wisconsin.

"The Relations between Gas Companies and their Employees," by Mr. Joseph M. Berkley, Los Angeles, Cal.

"Wrinkle Department," Edited by Mr. B. McAdam, Milwaukee, Wis.

LIBRARY OF CONGRESS APR 23 1906 SMITHSONIAN DEPOSIT

"A Lecture on Industrial Betterment," by Dr. Wm. H. Tolman, New York.

"A Lecture on Engineering of Illumination," by Mr. Van Rensselaer Lansingh, New York.

A banquet will be arranged for Thursday night and an entertainment provided for the ladies. Further details will appear in a future announcement.

Arrangements with the various Passenger Associations will be made for reduced rates on the certificate plan. The Secretary will be pleased to furnish application blanks to those wishing to become members of the Association.

A cordial invitation is extended to members of kindred Associations to be present. JAS. W. DUNBAR, Secretary.

BRIEFLY TOLD.

NOTES.—

MR. W. E. O'NEILL has been appointed Superintendent of the Norwich (N. Y.) Gas and Electric Company.

IN the midst of the horrors that are now besetting San Francisco, and convulsing the world with their terrors, we can only say to the fraternity (and they will well know the extent of the awfulness of the disaster before this notice reaches them) that despatches to us, dated from Oakland, the 20th inst., declare that all the stations of the San Francisco Gas and Electric Light Company have been destroyed. This, however, seems to us an exaggeration, for the main electric station looks to have been impregnable. Let us hope that the news is false.

THE Gas Machinery Company, of Cleveland, O., has been awarded a contract to install a 600,000 cubic feet per diem water gas set, complete with washer, exhauster, elevator, etc., at Meriden, Conn. The Machinery Company is also under contract to place a set of 16 by 20 purifiers at Pittsfield, Mass.

MR. F. H. CORSON, will retire from the staff of the Winnepesaukee Gas and Electric Company, of Laconia, N. H., in order to accept the position of Superintendent of the works that is to be constructed at St. Johnsbury, Vt. The change takes effect the 1st prox.

The Coming Meeting of the Mechanical Engineers.

An attractive programme has been arranged for the semi-annual convention of the American Society of Mechanical Engineers, May 1 to 4. The place selected, Chattanooga, Tenn., has much to offer in historical interest and natural beauty, and the several pleasure excursions planned to be taken between and after the professional sessions will doubtless insure a good attendance. The headquarters throughout the meeting will be at the Read House and will be open for registration Tuesday noon, May 1. The professional sessions will be held in the assembly hall of the Read House, Tuesday and Wednesday evenings and Wednesday and Thursday mornings.

The papers to be presented are as follows: Report of Committee on Standard Proportions for Machine Screws; Report of Committee Cooperating on Pennsylvania Railroad Locomotive Tests; "Effect of a Blow," by A. W. Moseley and J. L. Bacon; "Low Resistance Thermo-Electric Pyrometer and Compensator," by W. H. Bristol; "Manganese Steel," by Henry D. Hibbard; "A History of the Introduction of a System of Shop Management," by James M. Dodge; "Collapsing Pressures of Bessemer Steel Lap-Welded Tubes," by R. T. Stewart; "New Liquid Measuring Apparatus," by George B. Willcox; a number of short papers on water wheel governing, by Mark A. Replogie, George A. Buvinger, John Sturgess, George J. Henry, Jr.; "Efficiency Test of Turbine Water-wheels," by William G. Webber; "The Improvement of the Tennessee River and Power Installation of the Chattanooga and Tennessee River Power Company at Hale's Bar, Tenn.," by Thomas E. Murray.

Outlines of the transportation arrangements for reaching Chattanooga have been distributed to the members. For those in New England and the Eastern States two special trains will be run from New York city, and it is urged that all who can do so will arrange to connect with these trains. The entertainment of the members in Chattanooga will be taken care of by a local committee, of which Mr. Newell Sanders is Secretary. The latter should be advised by those expecting to attend, that they may be included in the arrangements for receptions and excursions.

[OFFICIAL REPORT—CONTINUED FROM PAGE 670.]

TWENTY-SECOND ANNUAL MEETING, OHIO GAS LIGHT ASSOCIATION.

HELD IN CINCINNATI, O., MARCH 21, 22 AND 23, 1906.

FIRST DAY—MORNING SESSION.

The President called upon Mr. W. E. Steinwedell, of Cleveland, O., who as Editor of the

WRINKLE DEPARTMENT,

read the following budget:

No. 1.—*Enriching Coal Gas with Oil.*—Saturate porous brickbats with oil, or put them in a vessel containing oil; when properly soaked, remove them so that the excess of oil will drip off the outside. They can then be stoked into a retort as readily as coal.—H. W. BENNER, Guelph, Can.

No. 2.—*Making Oil Gas in a Retort.*—Place an oil tank about 8 or 10 feet above the floor, and use about ½ gallon of gas oil per 1,000 cubic feet of coal gas made. In filling the retort use broken firebrick, which are thrown in loosely. Clean the retort every 7 days, to get the carbon and lampblack out, this cleaning taking about 20 minutes.—R. H. LAWLOR, Waterloo, Ia.

No. 3.—*Scurfing Retorts.*—The lid is held on by a cotter bar, and fits tightly against the mouthpiece. Use fireclay for the joint. Steam is turned on in the standpipe, and air is drawn into the back of the retort forward through the retort and out the standpipe. There are 3 unions on the lid for the different retorts. A schedule should be arranged for scurfing each retort, and only missing one charge during the operation. With this method there is no retort carbon to sell, as it is all consumed.—CARL STEINWEDELL, Butte, Mont.

No. 4.—*Repairing Holder Leak.*—A ⅝ inch bolt is filed flat 4 or 5 threads from the end, and a small hole drilled through same. A wire is fastened through this hole, a bar is strung on the wire and the whole placed on the inside of the holder, as illustrated. A steel plate and nut are used on the outside and the joint properly made with red lead.—A. C. PEASE, Lowell, Mass.

No. 5.—*Painting Gasholder.*—It is often necessary to paint a large holder without lowering it. This can be done by making a curved scaffold long enough to reach from column to column and narrow enough to pass between the holder and girders. It is hung from the top of the holder by 3 blocks, and the men can work from it with ease and safety. Small adjustable rollers allow it to be raised and lowered without catching the holder rivets.—DONALD MCDONALD, Louisville, Ky.

No. 6.—*Gasholder Oil Tank.*—The oil is admitted at the manhole on the roof, through a pipe which is connected into swing joints and attached to a blank in which there is a hole to receive a nipple, which forms the suction pipe. The water is siphoned from the holder pit as the oil is admitted, calculation being made to ascertain the capacity of oil that can be stored to keep the seal on the outside.—H. W. BENNER, Guelph, Can.

No. 7.—*Removing Weight from Governor.*—In cases where there is no night attendant, and a 2-lift holder, a weight can be removed from the governor as described: *G* is an alarm clock, connected, but not permanently fastened, to beveled block at *K*, this block tends to fly to the right, owing to the tension in spring *H*. On the incline rests the end of a piston of an old bicycle pump *E*, on the piston head, and inside of the cylinder rests the can of shot *C*. The latter is connected through a system of pulleys to the can *L*, also containing shot but weighing less than *C*. Can *L* rests on the screw of the mercury adjusting block of the governor. The drawing shows the cans set to give the desired night pressure. The small weight *A* takes up the slack of the cord, and allows the governor valves to move freely up and down. Now if it is desired to remove the weight at *L*, at say midnight, the alarm clock is set to ring at 12 o'clock. When the alarm "goes off" the winding-key turns in the direction of the arrow, the wire *X* is released, the spring *H* pulls the piston supporting the block to the right, weight *C*, being heavier than *L*, takes up the slack in the cord and, in falling with the piston through the cylinder *E*, raises the weight *L* and thus reduces the pressure in the mains. *F* is an air opening, with an adjusting slade, by means of which the escaping air from the cylinder can If this opening is almost closed, the weight *L* will

be removed very gently. At *K* there is a hole through which the piston rod passes on its downward course. The pressure is reduced so gradually that the pilot light in the arc lamps show no tendency to go out.—R. C. CONGDON, Atlanta, Ga.

No. 8.—*Burning Out Water Gas Checkerbrick.*—As soon as a water gas apparatus is shut down the oil spray is removed from the top of the carburetter and the stack valve opened, allowing a current of air to enter the top of the carburettor, which will burn the carbon and clean the checkerbrick. Similarly the manhole in the bottom of the superheater is provided with a capped pipe, and the cap is removed to clean up the superheater at the same time.—HOWARD MANN, Cleveland, O.

No. 9.—*Tar Burner.*—The tar burner is made from an old 3-inch globe valve, as illustrated, and the length of nose depends on the local conditions.—J. M. LANE, Paterson, N. J.

No. 10.—*Unloading Oil Tank Cars.*—This method can be used if storage tanks are lower than car tanks permitting siphoning. After removing cap of tar tank, lower neck through dome to within 1 inch of the bottom of car tank, and make rope fast. Open stopcock on outlet of funnel, open stopcock on 1¼-inch line to top of neck. Pump hand pump to fill neck with oil. When 4 inch line is filled with oil, which will be indicated when oil appears at the pump and flows into main oil line below gate valve, close 1¼-inch stopcock on neck, also 1¼-inch on drain funnel, then open 4-inch gate valve. After oil in car is down to such a point on which is about 150 gallons, the 4-inch suction breaks. Then disconnect unions on line to top of neck and connect a small line into tank, which enables you to practically empty car. This takes about the same time as old method of unloading.—J. M. LANE, Paterson, N. J.

No. 11.—*Grease Cup.*—Ordinary grease cups do not last long. The one illustrated is cheap, efficient and durable.—J. M. LANE, Paterson, N. J.

No. 12.—*Main Bags.*—The illustration represents a gas bag which has been used for a number of years. The bag is made from cloth usually used for bed sheeting, and cut in the shape described in the inclosed sketch. The bag is cut about 1½ inches larger than the circumference of the pipe, sewed and turned inside out, and dipped in linseed oil to make it hold water. The bag is placed over the hook and put into the pipe, after which the hook is removed and the ¾-inch pipe is fastened to the mouth of the bag. Water is poured into the pipe and fills the bag and stops the flow of gas. The pipe is supported by a stake, which keeps it in position. To remove the bag place hand at the mouth and pull out the pipe. Pull slowly on the bag, which will force the bag to the inner or top surface of the pipe and cause the water to rush out in a few seconds. From 2 to 3 pounds can be created on the bag, depending on the height of the water column, 15 seconds being necessary to insert the bag and cut off the flow of gas.

A 10 inch bag will bag-off a 10-inch and 8-inch pipe; a 6-inch bag will bag-off a 6-inch and 4-inch pipe; a 4-inch bag will bag-off a 4-inch, 3-inch and 2-inch pipe.—H. B. BENNER, Guelph, Can.

No. 13.—*Testing Bags.*—The illustration shows a method of testing a service pipe attached to the main with mercury pump and gauge, by the use of a special fitting and plug. The following results are obtained:

1. A safe means of making a service connection to main, preventing a leak of gas while service is being put in, as at *A*.

2. Affording a ready means of testing a service pipe while being run, as at *D*.

3. Useful, as shown at *C*, in shutting off for non-payment, saving the expense in cutting off the service. This can also be used inside of house, to shut off service when meter is removed.—A. H. GINDELE, Jersey City, N. J.

No. 14.—*Concrete Service Box.*—Stop boxes are often lifted out of the ground by the frost, as the top, being considerably greater in diameter than the barrel, the frost raises the ground, the hard surface catches under this expanded top and lifts it up. When the ground thaws and the surface goes back, the stop box stays up, and the clients of damage suit lawyers stumble over them. A complete remedy for this is obtained by making the top section of our stop boxes of concrete, conical in shape, as illustrated. The hole in the lid serves for ventilation, and at the same time furnishes a hold for a rod with which to take the top off. Make the concrete cones in sheet iron moulds, with wooden cores running through them. One man can easily mould a dozen of them in an hour. The material, entering into them is very little, the total cost certainly not exceeding 3 cents each.—DONALD MCDONALD, Louisville, Ky.

No. 15.—*Stove Cleaner and Polish.*—Dissolve 2 ounces of beeswax in 1 quart of gasoline and ¼ of a pint of turpentine. Shake the mixture well before using, Apply with a cloth to clean the stove, and then polish with another cloth. This cleaner and polisher have been used for over a year, and find them to be the best thing of its kind that has been tried.—J. M. ROBB, Peoria, Ills.

No. 16.—*Meter Cards.*—All the projections on top are clipped off, up to the year when a meter is first set or an old meter reset, so as to readily see that all of the meters come in for inspection and test regularly and are not overlooked. The advantage of the cards is appreciated in an instant, if a tray full of cards is seen. The tabs indicate that the meter has not been tested in the year marked on the tab or in any succeeding year. It is but a moment's work to glance along a row of tabs and see just how many meters have not been tested in any particular year within the limits of time indicated by the dates on the tabs.—R. E. SLADE, Hartford, Conn.

No. 17.—*Method of Handling Slot Meters.*—Consumers' accounts are kept in loose-leaf ledgers. Slot meter sheets are printed on red paper, to readily distinguish them, and are inserted in their regular order as they come in the routes. The first 3 columns are for the date, statement and amount of gas for the statements reported by our regular meter readers, in order to keep a record of the gas sold, which will correspond in time with our sales, as shown by our regular meters, and also to check reports of slot meter collectors. The fourth column is for the statements reported by slot meter collectors. The fifth column is for the total gas delivered, as shown by the difference between the set statement and the last statement reported by the slot meter collector. The sixth column is for the total cash collected from the meter, and with each entry the total gas delivered is checked with the cash received. If the gas used exceeds the cash paid, the meter is removed and investigated. The seventh, eighth and ninth columns are for the reports of the collectors. The tenth column is for the date when collection ticket is issued. This date is stamped in when the collection tickets are checked with the ledgers. The object is to keep tab on the tickets in the collectors' hands, and the collectors are made to account for all tickets delivered to them. If for any cause they are unable to make a collection, the cause is noted on the ticket and returned with cash tickets. All such reports are posted in "Remarks" column. The addresses for slot meter accounts are set up for our addressograph, each address bearing the meter number, size and location. At collection time the addresses are printed on slips of paper, the slips checked with the ledgers, at which time the date is stamped in the 10th column and slips are then delivered to collectors. When collections are made, index of meter, date, cash and collector's name are entered on slip, which is then used as a cash ticket; the account is posted from the ticket and the tickets are then filed for future reference.—J. M. ROBB, Peoria, Ills.

No. 18.—*Taking Meter Statements.*—This method can only be used in connection with an addressing machine, printing a 3-line address. Meter number, size and location are set up on third line of address. Each month, at meter reading time, the addresses are printed on slips of paper, which are then stapled together in pads for meter readers. This gives the meter readers a new sheet each month, and, as no previous statement of the meter is given, it is impossible for them to estimate a statement. It also gives the meter readers an easy means of reporting complaints or disorders, which can be noted on the slip and forwarded to the complaint and order department after the statement has been copied by the bookkeeper. If the bookkeeper considers it necessary to secure a re-reading, it is only necessary to hand the slip back to the meter reader. Misses are easily handled, since the meter reader retains the slips for statements he has not secured, only reporting each day the slips for secured statements. We use a card index addressograph and each bookkeeper has at his desk a case in which the addresses are filed in drawers like cards, so that there is not much work required to keep the addresses to correspond with the ledgers.—J. M. ROBB, Peoria, Ills.

No. 19.—*Nee Extractor Useful in Gas Works Laboratories.*—I have tried several forms of extraction apparatus for applying carbon disulphide to spent oxide, and finally devised the apparatus shown in the sketch, which works admirably. The percolator is made specially and has a slight constriction at the top; the condenser is a short, wide test tube, the lip of which overlaps this constriction, and is fitted with a

2-hole cork to allow of tubes for inflow and outflow of cooling water. The condenser is a suggestion of Prof. A. S. Mitchell, of Milwaukee, and cannot sweat, no matter how moist the air is. A glass tube, bent as shown, passes through the neck of the percolator. A little cotton is tamped in and the oxide poured on top. The percolator neck passes through a cork and is fitted to a wide-mouth flask containing 20 or 30 c. c. of disulphide. The apparatus stands on a steam plate or above a flame turned very low, the solvent vaporizes and passes up the tube, condenses on the test tube and returns to the flask through the oxide. To avoid the action of disulphide on the cork, it is treated by weighting it down into a beaker of glycerine and placing under a vacuum bell to exhaust the air from its pores. After saturating with glycerine, the surface of the cork is wiped dry and it is found to be entirely impermeable to disulphide vapor. The apparatus takes up little room, and several of them can be connected in a battery and left for days at a time on the steam plate or water bath without being noticeably in the road and without giving off any odor. It is suitable also for determining free carbon in tar, pitch, etc., the charge being held in a cone of filter paper.—H. B. HARROP, Milwaukee, Wis.

No. 20.—*Protecting Porcelain Pyrometer Tubes.*—The porcelain sheath of the Le Chatelier thermo-electric pyrometer cracks the first time it is introduced into the combustion chamber of a bench unless the utmost care is used in heating it up slowly. An inexpensive protection has been tried out at Milwaukee, and found to answer the requirements. A sheet of 1/32-inch asbestos board is cut about 3 inches longer than the sheath to be protected and about 8-inch wide. This is spread out on a perfectly flat table, and saturated with water by means of a sponge. It is then sufficiently plastic to be rolled carefully around the porcelain sheath, and the projecting end is moulded together to form a cap. As soon as dry, the arrangement is ready for use, and will pass readily through an ordinary sight hole. The pyrometer takes longer to rise to temperature, but the porcelain is entirely relieved of the unequal heating action of the flame. Ordinary commercial asbestos board answers for common bench temperatures, and with care may be used a dozen times at temperatures of 2,400° F. to 2,500° before replacing. Several bands of No. 16 nickel wire may be turned around the asbestos sheath as an extra precaution, though this is not necessary. From 2,500° to 2,600° the asbestos sheath tends to fuse to the porcelain, and between 2,600° and 2,700° it breaks down entirely; the nickel wire also goes out through this last range. The fusing is the direct result of impurities in the commercial asbestos, and may be avoided for these higher temperatures by washing the asbestos with nitric acid and then with water before making up the sheath.—H. B. HARROP, Milwaukee, Wis.

No 21.—*A Modification of the Orsat-Muncke Apparatus.*—Mr. N. H. Randall is the originator of this apparatus, which has been in use for several months; 25 to 30 analyses of various gases, including illuminating gas, being made daily. It has proved entirely satisfactory in every detail, giving very rapid and extremely accurate results, the time required for making a complete analysis of illuminating gas being 25 minutes.

The burette is of 100 c. c. capacity, the narrow part is graduated from 102 c. c. to 50 c. c., there being no graduation on the wide end. The wide and upper end of the burette, instead of terminating with a capillary tube in the usual manner, is tapered to about ¾-inch inside diameter; and on this is fused the barrel of a stopcock. Into this barrel is fused, at right angles to the burette, 6 capillary tubes of 1½-inch in length. A section of this stopcock, with capillaries, is shown. It was anticipated that any compression of the gas in the burette would have a tendency to force this stopcock upward, thus introducing an error. The writer has made several hundred analyses with the use of this apparatus, but has never had any trouble or inconvenience from this source. The accumulation of dirt and grease in a burette is not an uncommon occurrence. In the event of this, the ease with which this burette may be cleaned will be seen at a glance; the stopcock being removed, the inner surface is swabbed and washed without removal from its position, or the detachment of any part of the apparatus.

The construction of the absorption pipettes will be seen from Fig. 1*b*, the gas passing through the reagent, giving very rapid and complete absorption. This method of absorption was applied to the Orsat apparatus by Mr. Randall several years ago, and has been in constant use in this laboratory. The principal feature of this apparatus is the absence of the long header capillary tube, from which the gas cannot be expelled. This header is an objectional point in the latest modifications of the Orsat apparatus. There is not 1 inch of capillary tube on this apparatus that cannot be filled with reagent, thus expelling the gas entirely from all parts of the apparatus except the burette. The absorption pipettes, instead of being in the form of a U-tube, terminate with a narrow tube of ¾-inch outside diameter, which is fitted into a flask by means of a rubber stopper. The flasks are of 300 to 400 c. c. capacity, thus giving a considerable amount of reagent. Fig. 1*c* is a pipette designed for the use of stick phosphorus, it being used in preference to sodium pyrogallol solution. However, the latter may be substituted. The reagents are sealed from contact with the atmosphere by means of the device shown in sketch. There are 3 of these seals.[1] The whole apparatus is firmly and neatly mounted on a mahogany frame, and is light and portable. The reagents are very conveniently renewed, by detaching the pipettes and flasks from the burette, then removing the pipettes from the flasks. The hydrogen and methane are determined by explosion over mercury.

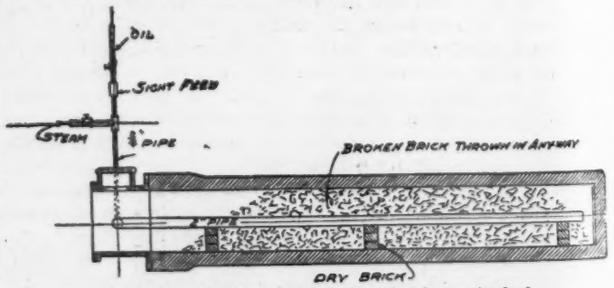
Any form of pipette may be employed for this, it being attached to the capillary on the front of the burette. This capillary is also used for admission of the sample. The following analysis shows a comparison of work done on this modification of the Orsat, and work done on the Hempel apparatus. Analysis made on the Hempel, and required 1 hour and 10 minutes:

Carbon dioxide	2.05	per cent.
Oxygen	.10	"
"Illuminanta"	4.30	"
Carbon monoxide	6.95	"
Methane	36.50	"
Hydrogen	44.25	"
Nitrogen	5.85	"

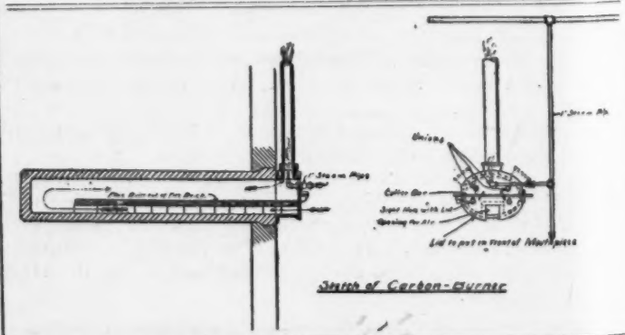
Analysis made on the apparatus as described in this article. Complete analysis was made in 25 minutes; the hydrogen, methane and nitrogen were checked on same sample in 8 minutes.

Carbon dioxide	2.10	per cent.		
Oxygen	.05	"		
Carbon monoxide	7.00	"		
Methane	36.71	"	36.81 per cent.	checked.
Hydrogen	44.27	"	44.10 "	checked.
Nitrogen	5 62	"	5.69 "	checked.

The same gas was used in both the above analysis.—S. S. MARTIN, EDWIN H. RANDALL and EDWIN BARNHART.



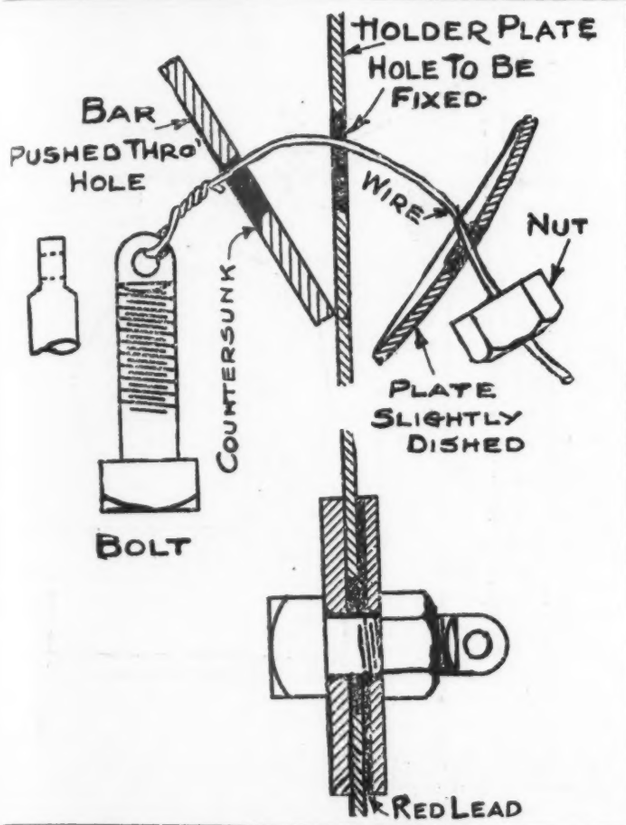
Note.—Place oil tank about 8 feet above floor for gravity feed.

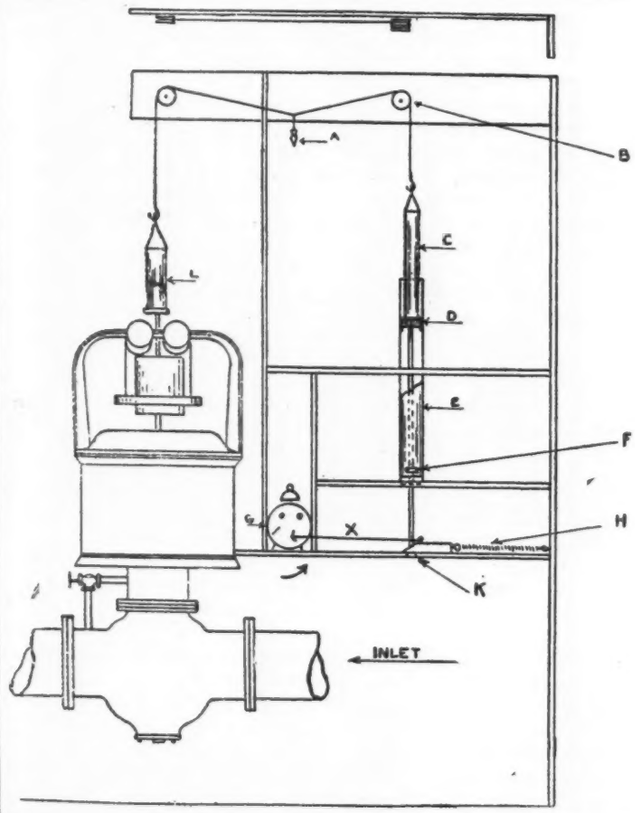


1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917
COMPANY NUMBER			MAKER		MAKERS №		DATE BOUGHT		SIZE					

DATE SET	STATE	ACCOUNT NUMBER	DATE REMOVED	STATE	DATE TESTED	% ERROR

1. This seal was substituted for the form shown in the photographs.


HOLDER PLATE
HOLE TO BE FIXED
BAR PUSHED THRO' HOLE
WIRE
NUT
COUNTERSUNK
PLATE SLIGHTLY DISHED
BOLT
RED LEAD


A
B
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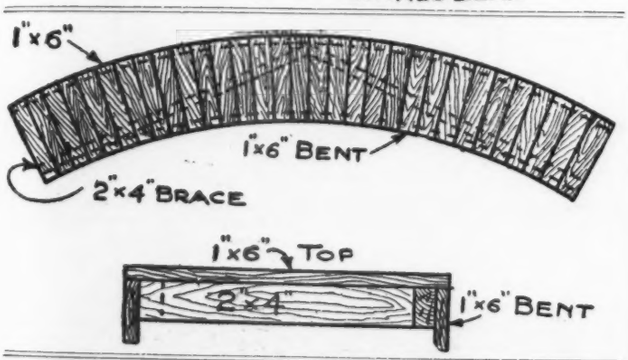
INLET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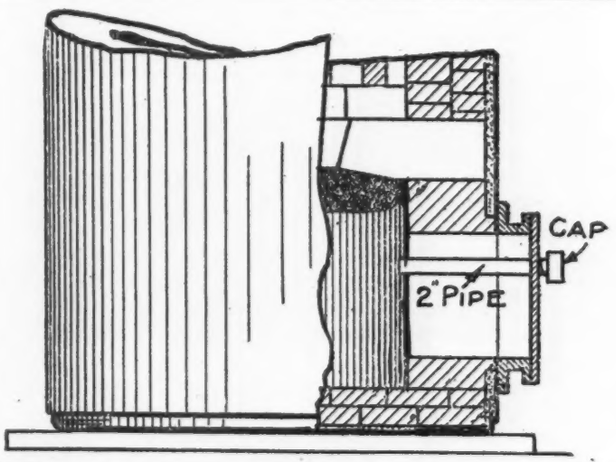
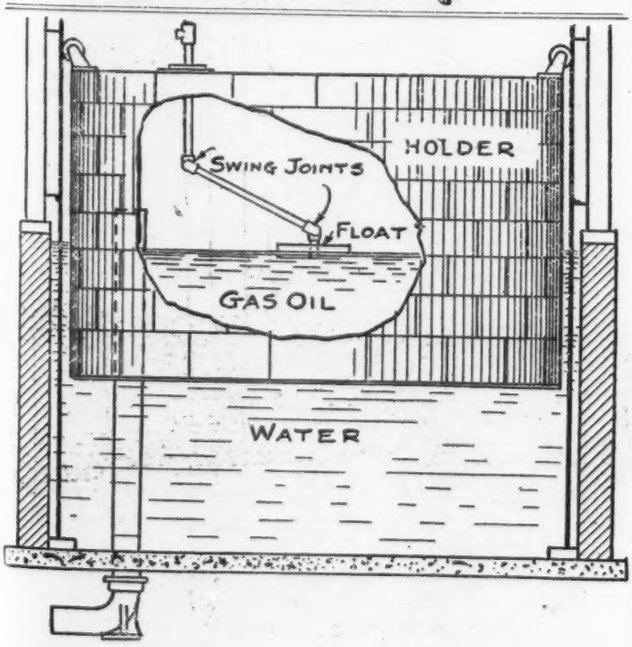
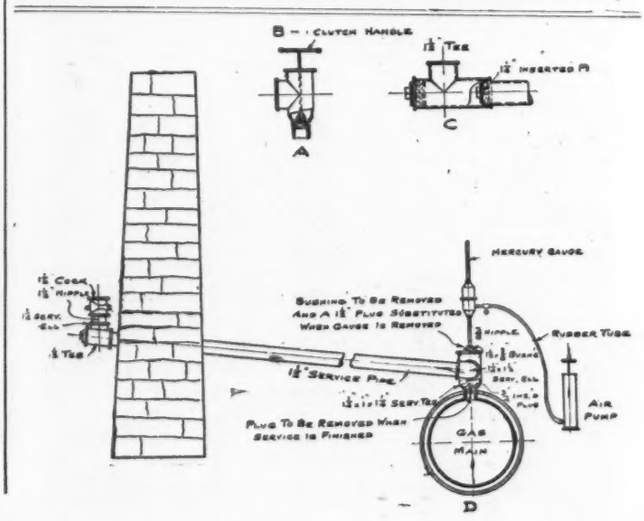
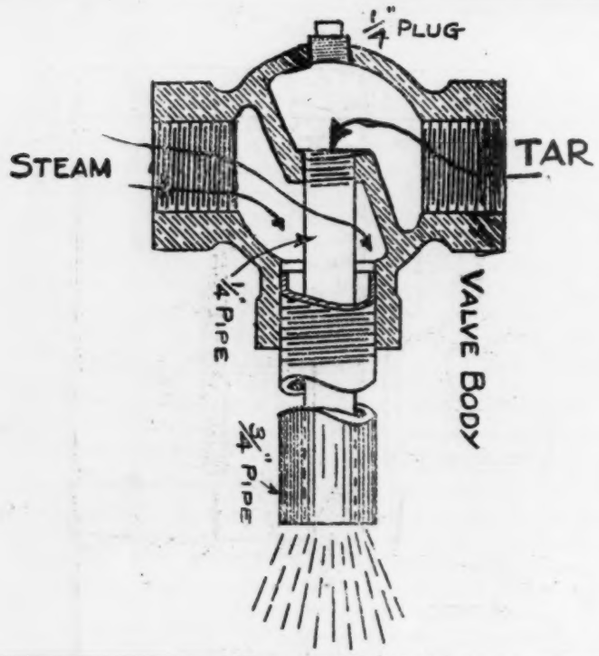
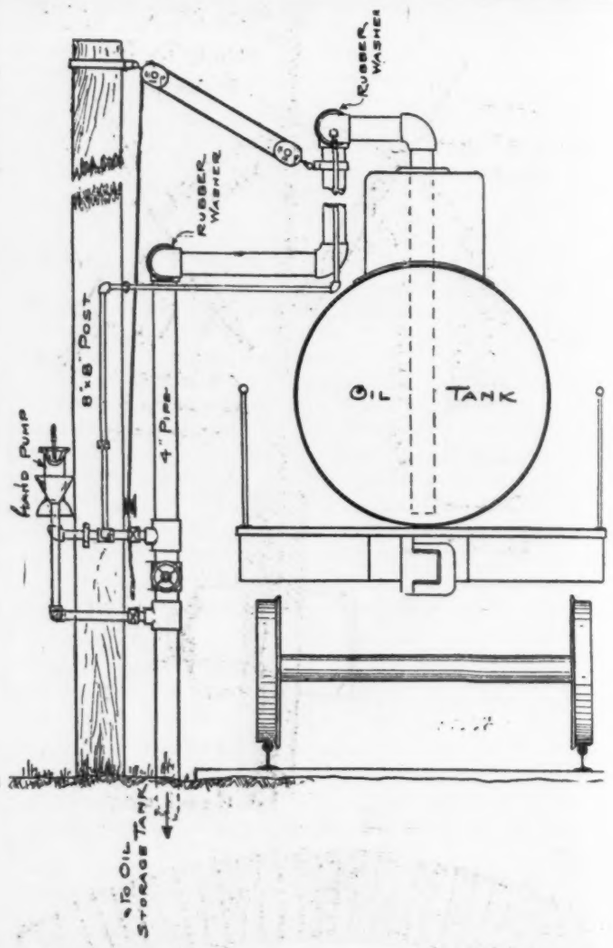
1"x6" BENT
2"x4" BRACE
1"x6" TOP
2"x4"
1"x6" BENT

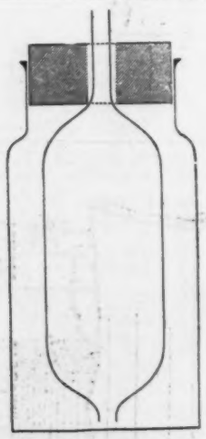

CAP
2" PIPE


HOLDER
SWING JOINTS
FLOAT
GAS OIL
WATER


B — CLUTCH HANDLE
A
C
MERCURY GAUGE
RUBBER TUBE
AIR PUMP
GAS MAIN
D

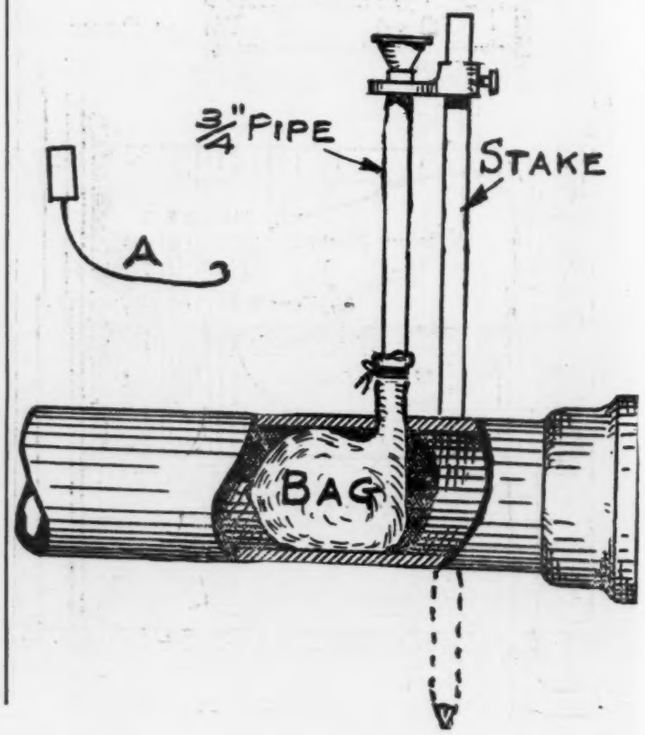


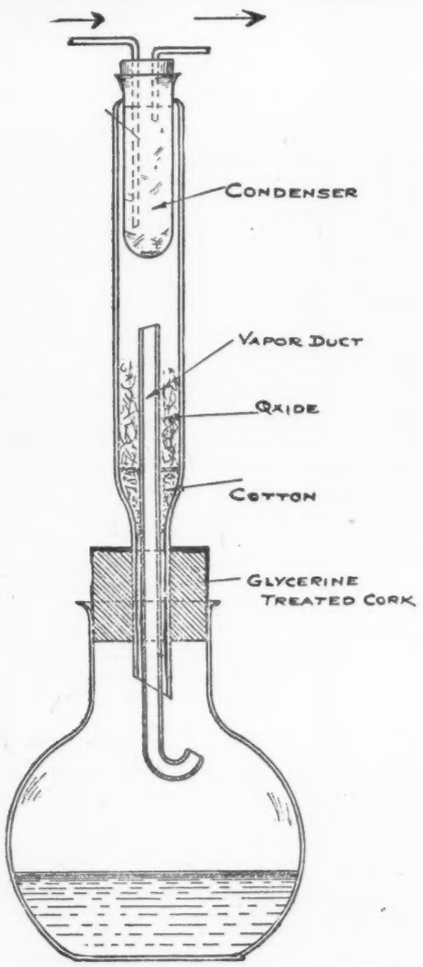


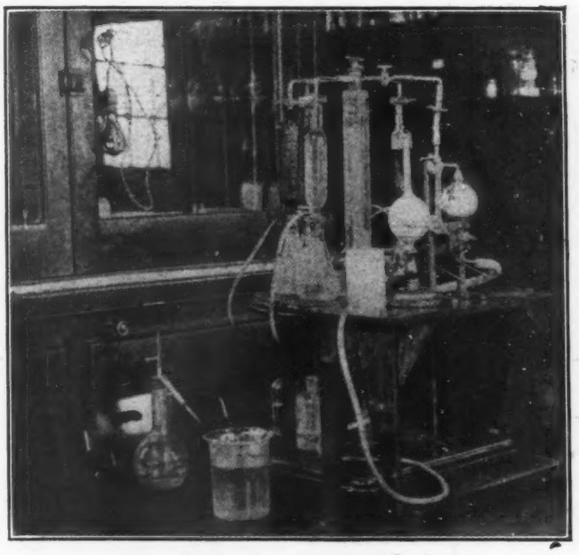


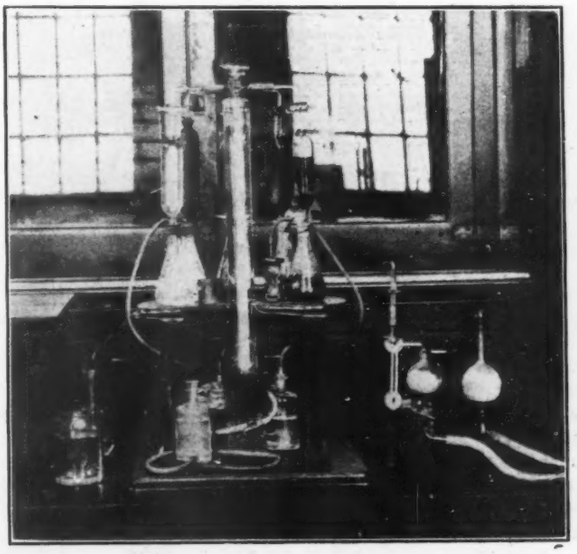
CAST COVER

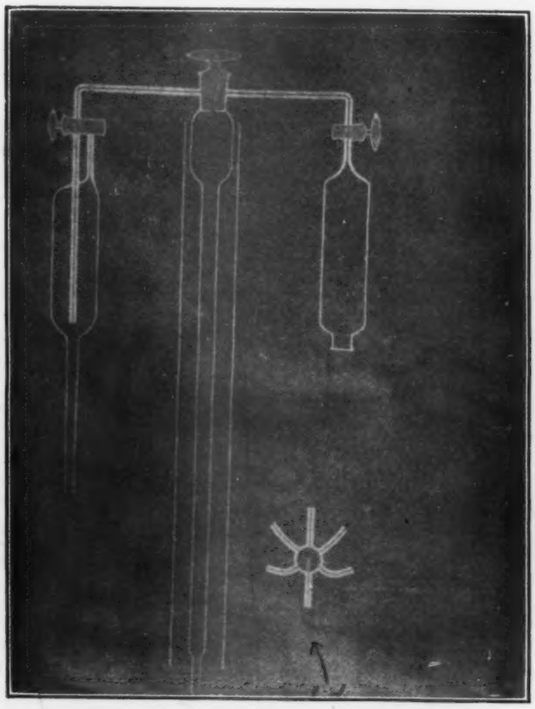
CONCRETE STOP BOX.

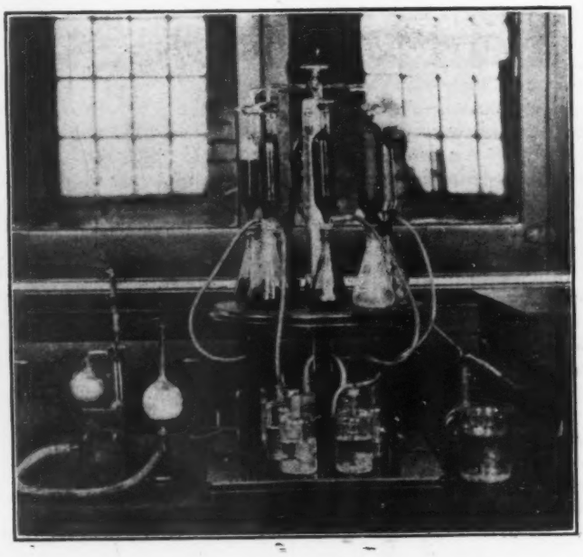


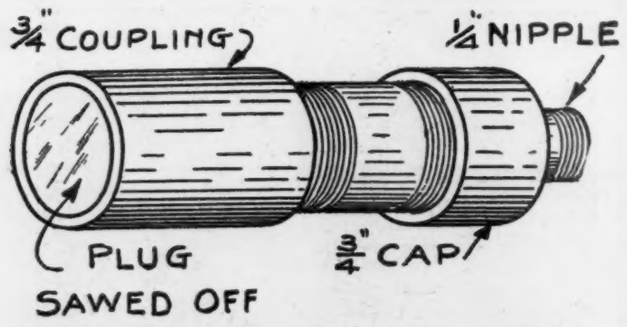

CONDENSER
VAPOR DUCT
QAIDE
COTTON
GLYCERINE TREATED CORK

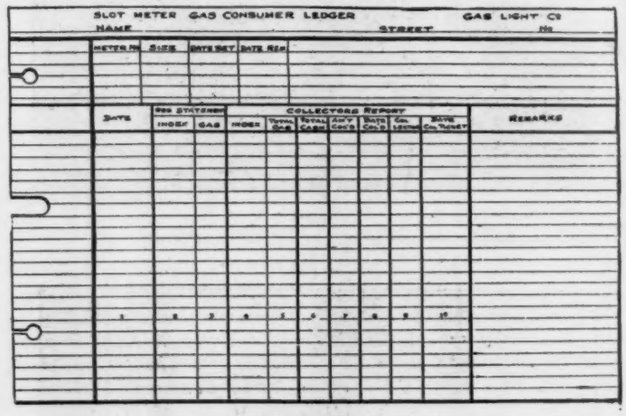











SLOT METER GAS CONSUMER LEDGER — GAS LIGHT CO

NAME — STREET — No.

METER No. | SIZE | DATE SET | DATE SIZ

DATE	PRE STATEMENT		COLLECTORS REPORT							REMARKS
	INDEX	GAS	INDEX	THOUS. CU. FT.	TOTAL CASH	ANY CHECK	DATE CO. IS	CO. USE	ALIAS CO. TICKET	

For gas pressures in outlying districts, mine ventilating pressures, draft or light vacuum, the gauge illustrated in Fig. 2 is adapted, since it is capable of recording pressures as low as $\frac{1}{20}$-inch head of water. Connection is readily made by means of a rubber hose to nipple, which projects through the side of case. A simple clamping device is employed to hold the pressure tube rigidly when the gauge is being transported. Those who are interested in the distribution of gas will be particularly interested in noting the production of an instrument which will be of such great assistance in solving their problems.

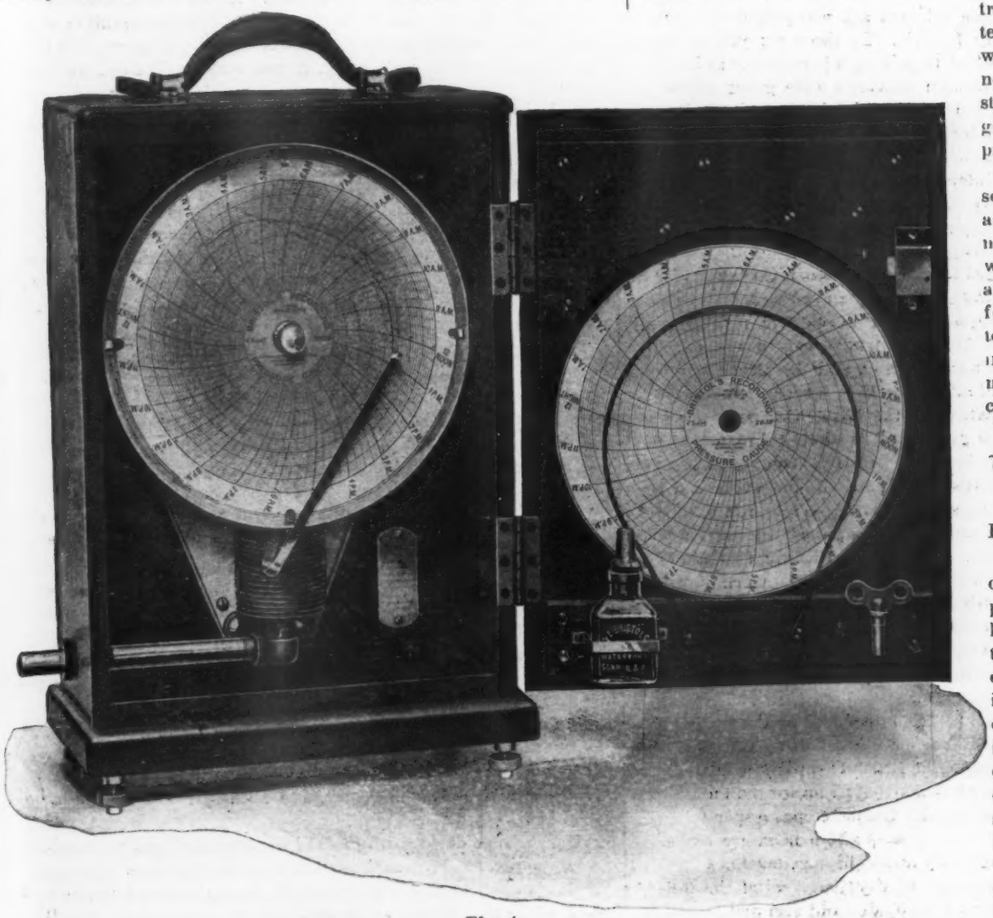


Fig. 1.

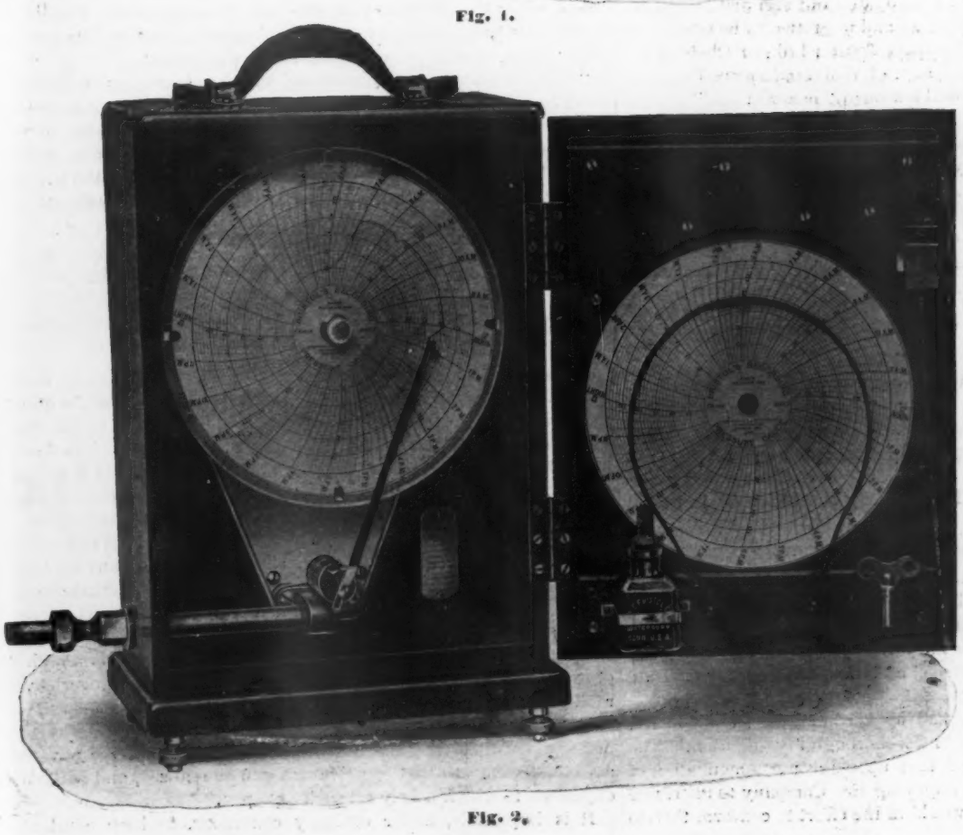


Fig. 2.

The portable gauges above described weigh about ½ as much as the standard form gauges mounted in a carrying case, which has been used heretofore, as a substitute. Both forms are furnished with leveling screws to facilitate adjustment of the instrument. Provision is also made for carrying a supply of charts and ink with each gauge.

The Survival of the British Electrical Manufacturer.

By R. A. Brown, in *Elec. World.*

The directors and shareholders of electrical manufacturing companies domiciled in Great Britain have been taking very serious interest in the first parliamentary election for over half a century in which "Free Trade" has been called in question. The electrical industry has suffered somewhat cruelly from unrestricted foreign competition, not so much in respect of the actual volume of business secured by American, German and other manufacturers, which appears to have amounted to about £2,000,000 per annum, as of the depressing influence on prices. It is clear that competition has been much intensified by the free entry of foreign goods, so that the two largest works in England, which have a good deal of American capital in them, are both unable to pay dividends, with all their special advantages in having the technical and commercial assistance of their parent concerns in the United States.

When we reflect upon the succession of misfortunes which have in the past made electrical manufacturing not merely hazardous but apparently hopeless as a permanent industry in Great Britain, it is most interesting to observe in what courageous manner old-established firms have kept up a dogged struggle against the difficulties of the situation. If we take, for example, the oldest of them, the Brush Electrical Engineering Company, there are features in its history which are a remarkable testimonial to the endurance and adroitness of the British business man. In the first place, when the Brush Company was founded, and began to look around for business, the

British legislature closed the market effectually by passing a ridiculous Electric Lighting Act in 1882, which made it impossible for companies to supply electricity with any hope of financial success; and it was not until six years later that a more tolerant act was passed which made electric lighting commercially feasible. In those six years, British makers of electrical apparatus had to pick up a bare living as best they could, while American and German concerns were going ahead and getting a good lead; so that when business did begin to boom in England the foreigners were much better able to compete for it than the stunted and starved British manufacturers. All British electrical legislation was conceived in the interests of the municipalities that were slow to move, and consequently the country was much behindhand in electric traction as well as supply; and when tramways at last came to be constructed the Americans reaped a rich harvest.

Still the British firms managed to live. The Brush Company, for instance, made a really heroic effort, and in a year or two actually gained a notable position as the largest builder of electric rolling stock. Whereas, at first, nothing but American trucks were used on British street railways, the position is now reversed, and the Brush Company supplies about three-quarters of all the trucks in service. Supported by a prosperous rolling stock department, the Brush Company was then able to nurse and stimulate the growth of its electrical manufactures, and during the past three years has been greatly extending its business in generating plant, motors, transformers, etc. It has evolved a type of the Parsons turbine possessing some remarkable features, giving exceptional efficiency, and at the same time has gained a leading reputation for its reciprocating engines. The British Electric Traction Company, which controls about 60 traction and supply undertakings, has become invested largely in Brush shares, and purchases its requirements from that concern, so that the company is at present in a more flourishing condition than for many years past, and is at this moment making considerable additions to its premises and plant to cope with greatly increased business.

If a slight measure of protection were introduced by the British Parliament—and many shrewd political prophets believe that this will happen during the next five years—the Brush Company would receive a further stimulus, and there is no doubt that its prolonged but victorious struggle against overwhelming odds has developed a spendid fighting spirit in its directors and chief officials, whom necessity has compelled to exercise constantly ingenuity and vigilance.

Of course there are other examples of the "survival of the fittest," and among the British companies that by dint of sheer grit and power of endurance have managed to hang on and to grow may be mentioned such standard "old-timers" as Crompton & Co., Ltd., of Chelmsford, and the Electric Construction Company, of Wolverhampton, England. In addition to these specimens of well-seasoned "hearts of oak" are one or two other concerns of lesser magnitude, but equal toughness that have come safely through years of "batle and breeze." Amid the crop of new covers they are likely to be overlooked and forgotten, even here in England where we relish and favor so much anything that has a touch of antiquity about it; but the mere fact that they have endured is to their credit, and the point is now made on their behalf.

Mr. A. C. Humphreys Pays His Respects to the New York State Commission on Gas and Electricity.

Some evenings ago President A. C. Humphreys, of the Stevens Institute of Technology, Hoboken, N. J., at a dinner of the graduates of the Civil Engineering Course of Columbia University (about 150 were present) which was served in the Hotel Astor, had these things to say about certain acts of record made by the State Commission on Gas and Electricity—most gas men will be in hearty concord with President Humphreys' expressions:

"Let us consider a case of so-called reform near at home. In the case of a certain industry public clamor has been cultivated by the yellow journals and especially by 'the' yellow journal. No doubt cause had been given for complaint, but the causes were specific, not general. But this was enough for the yellow journal to say that every feature of the management was wrong and that nothing was or could be fair or honest about the management.

"First, an investigation was had by a committee from Albany. This is generally spoken of as a 'most thorough investigation.' The thoroughness is seen when we find that upon the recommendation of this committee a law was passed requiring the Company to distribute its product under conditions that would in the effort to conform thereto necessarily deprive a consumer of a satisfactory supply, and even then the Company would be subject to $1,000 fine as often almost as the authorities wished to make inspections. As the result of this investigation—which was so remarkable for its completeness—a law was passed to place this industry under the control of a Commission. The business being one of much complexity, it was reasonable to expect that the Governor would not only try to appoint able and reputable men, but men already qualified to deal with the problems to be presented, men not subject to political pressure.

"The undertaking was a difficult one, even for a competent Board—competent, I mean, by reason of particular training along specific lines. As nearly every branch of engineering is involved, should we not expect that on such a Board there would be at least one engineer? As many questions of business policy and management are involved, should we not expect that there would be at least one member with a broad business experience? No—all three appointees were lawyers, and all three apparently subject to political pressure.

"I wish it distinctly understood that I make no reflections on these gentlemen personally; I am finding fault only with the system. Furthermore, none of them apparently had had such a qualifying experience in commercial matters that they could readily take in the full and true meaning of a statement of accountants. Fortunately there was a judge, and he had had experience in balancing conflicting evidence.

"Speaking from a fairly full and broad experience in such matters, I deliberately express the opinion that if such a Board is to be recruited from one class or profession only—though there is no necessity for such a course—a better result could be obtained from a board composed of 3 engineers than from one composed of 3 lawyers, and especially if these engineers were accountant engineers. I firmly believe that selected engineers are as competent to decide questions of law as selected lawyers are competent to decide questions of engineering.

"I am making no attack on lawyers or on politicians, but I claim that men who are called upon to act on matters so important and charged with technicalities should have had previous experience to qualify them to act intelligently, and above all they should be under no political obligation.

"In this case, the course pursued is definitely open to criticism, for the Legislature which passed the law and the Governor who appointed the members of the Board put pressure upon the Board to render a decision while the investigation was not yet completed. Finally, the Legislature took the matter out of the hands of the Board by passing a bill to cover some of the cases still under advisement.

"What a parody upon justice and what a reflection upon themselves in having first committed the matter to a Board of their own making, presumably that the facts might be developed by a dispassionate and intelligent investigation as a guide to any action to be taken, and then taking the matter out of the hands of the Board because the investigation necessarily took more time than the politicians believed to be necessary."

Working of Retort House Governors.

[A paper read before the Midland Junior Gas Engineering Association by MR. LESLIE WILSON, of Stafford.]

In an ordinary gas works retort house, the conditions of working inside the hydraulic main have an enormous influence on the quantity and quality of gas and bye-products yielded, due chiefly to the effect of such conditions on that which takes place in the retort. The function of the retort house governor, as it is usually employed, is to maintain, in the hydraulic main, more constant and unvarying conditions than can be obtained by the use of any ordinary type of exhauster governor. The retort house governor is usually mounted on the foul main as close as possible to the retort bench, and should respond to any increase or decrease of suction on the exhauster side or to the fluctuations in the gas productions on its inlet. The use of these instruments, therefore, should result in unvarying suction of any required degree, or, if desired atmospheric pressure in the hydraulic main conditional on a high state of suction between the exhauster and the retort house governor, thus rendering it feasible to reduce to a minimum, or even dispense altogether with the seal. In no one case can any pressure in the hydraulic main be desirable. By the use of these governors all the advantages associated with anti-dip contrivances can be realized, and without the objections to which nearly all such are open.

It is impossible, under ordinary conditions, to keep constant th

amount of suction thrown by the exhauster. This is always subject to temporary variations, due either to changes in pressure of the steam supply to the engine, or to fluctuations in the make of gas; the exhauster governor not being sensitive enough to immediately neutralize these variations. With a retort house governor working properly, a gauge glass connected to the hydraulic main will show very little or no effect when a retort lid or lids are closed after charging; whereas under ordinary conditions, with the best of exhaust engine governors, a temporary decrease in the amount of suction is bound to occur during the time necessary for the bell to rise and the engine to gather speed. The majority of exhauster governors are not sensitive enough to prevent oscillation, temporary pressure, or excessive suction in the hydraulic main; and whenever any of these occur, a prejudicial effect on the yield or quality of the gas is bound to be exercised.

The retort house governor, in addition to counteracting increase or decrease of suction or pressure, greatly minimizes in the hydraulic main and retort that constant rising and falling in the amount of suction which is found on the inlet of all exhausters of ordinary type, and due to the revolving blades of same. It is interesting to note that this oscillation is intensified by a hydraulic seal; but in the case of a retort house governor, working with absence of seal, such oscillation is practically non-existent in the retort.

It may be worth while to emphasize briefly the importance of constantly maintaining as nearly as possible atmospheric pressure in the retorts, and the desirability of working with a minimum of hydraulic seal; and also to review the chief advantages derivable from such conditions of working. It is, of course, well known that either pressure or suction in a retort is objectionable. Pressure is bad, because if the retorts are unsound gas is lost through cracks, etc.; some of the richest of the gas being lost in this way during the first stages of carbonization, when pressure is likely to be heaviest. Undue pressure in a retort is likely to result also in excessive baking of the gas, which means decomposition of ammonia and some of the most valuable of the hydrocarbons—valuable on account of their light and heat giving properties, and also as solvents of naphthaline—with the formation of hydrocarbons of a different nature, including naphthaline, and with the consequent decomposition of scurf. Another source of trouble arising from excessive pressure in retorts is that of choked ascension pipes—an evil which is the cause of still greater pressure in the retorts, and losses due to slacking of lids. Overpulling—that is to say, working with a lighter seal on the dip pipes than the amount of pull in the hydraulic main—might very likely have a beneficial effect in the case of newly charged retorts, as it would tend to relieve the pressure in same. But it involves, of course, the sucking into the hydraulic main of air and furnace gases; air where a retort lid is open and through possible leaks in the ironwork, and furnace gases through holes in the retorts, during distillation.

Presumably the ideal conditions for carbonization are constant atmospheric pressure, or very slightly over, in all retorts and at all stages of distillation. This would appear to be best achieved by so regulating the pull on the hydraulic main and the seal in same that no suction is exerted on retorts in which the charge has practically ceased to give off gas, and, at the same time, the minimum of pressure thrown on newly charged retorts. The amount of this pressure will depend on the area in ascension pipes; but if this is sufficient, the pressure, even in newly charged retorts, should, be very little (if any) above that of the atmosphere. To maintain such conditions constant and unvarying may be said to be impossible, without more sensitive means of governing than is provided by most exhaust engine governors.

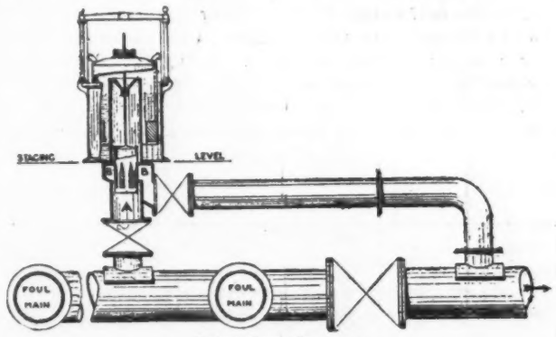
Now, with regard to the depth of seal; it is generally admitted that the less this is the better. Oscillation is always experienced with a hydraulic seal; and the amount of such oscillation is much aggravated with increasing depth. A seal of several inches would, undoubtedly, induce oscillation to such an extent as to cause alternate heavy pressure and suction in retorts; and a light seal results in but a minimized form of this evil. Another objection to a heavy seal may be illustrated by a quotation from "Newbigging's Handbook."

The hydrocarbons contribute largely to the illuminating power of the gas, and it is therefore desirable to retain them in the permanently gaseous form. Some of them, especially such as are of the greatest density, are reduced to the liquid state by the mere mechanical reduction of their temperature; whilst others of equal specific gravity, and many of those of lower density, undergo a change from the gaseous to the liquid condition by reason of the solvent or absorbent action of the liquid contents of the hydraulic main, through which, by reason of the dip, they have to pass, or with which, in the absence of the dip, they come intimately in contact.

It seems only reasonable to suppose that the absorbent action of the liquid on the hydrocarbons must be much greater if these are bubbled through it than if they merely strike and flow along the surface. It is fairly obvious, therefore, that the less the depth of seal the better, and that entire absence of seal is calculated to give the best results; but it may be said to be unwise to reduce same to less than half an inch without some such sensitive means of governing the suction as a retort house governor affords. The majority of exhauster governors are usually not nearly sensitive enough.

The object of the foregoing remarks concerning pressure and suction in retorts and depth of seal has been to make clear that the best carbonizing results, as regards quantity and quality of gas yielded, are obtained by reducing to a minimum, or abolishing, the seal, and keeping down the pressure in the retorts as low as possible without pulling on those in which no gas is being evolved, and avoiding even temporary suction or undue pressure in any of them. As before remarked, if the ascension pipes are of sufficient area, and are kept clear, the pressure, even in retorts in which gas is being given off at the maximum rate, should not rise above that of the atmosphere. It is only with the help of retort house governors that these conditions of working become practicable.

The governor usually employed in this capacity is the Charles Carpenter retort house governor, made by Messrs. Parkinson and W. & B. Cowan, Limited. A sectional sketch of one of these governors,



Retort House Governor.

showing the connections, will probably convey a better idea of its principle and the method of mounting than could be given in a page of explanation. On top of the inlet valve is a cast iron box divided into two sections, marked *A* and *B*, and which may be described as inlet and outlet chambers—*A* being the inlet, and *B* the outlet. In the top of this box, and in the division between the two chambers, are round holes with machined edges, and of the same diameter as the governor connections. Above this inlet and outlet box is a cast iron annular tank, in which floats a sheet iron bell; the interior of same being open through the center of the valve to the governor inlet. Suspended from the crown of the bell is the valve, which is of the Cowan type. It consists of an iron cylinder, open at the ends, machined on its outer surface, and slotted in the usual manner. This valve closely fits in the above mentioned holes in the inlet and outlet box, and has a vertical travel in same.

Thus the gas, entering the inlet chamber *A* at the bottom, is forced to pass upwards into the valve, then through that portion of the gas ports above the division, and so into the outlet chamber *B*. It will be seen that, should any variation in the amount of pressure or suction on the governor inlet or outlet occur, the bell will be almost simultaneously raised or depressed, so increasing or reducing the port area available for gas passage; and by thus varying the resistance opposed by the valve to the flow of gas, a regular condition of pressure, suction, or equilibrium can be maintained on the governor inlet—that is to say, in the hydraulic main—the amount of such suction, etc., being regulated by the adjustment of weights on the governor bell. It will, of course, be seen that, owing to the restricted area of gas passage in the governor, a much greater amount of suction is required to be exerted on its outlet than is obtained on its inlet. Thus, if working level gauge on the governor inlet, the amount of pull thrown by the exhauster will need to be something in the neighborhood of 2 inches. This depends on the adjustments of the governor, the number of holes in the valve, etc. The governors are made in various sizes, to suit different makes of gas.

Two 8-inch retort house governors have been in operation at the Stafford gas works for 7 months. They are mounted in the manner shown in the illustration. There is one governor each to 2 benches of

4 beds each, the beds containing nine 20-feet retorts; and they are situated in each case as close as possible to the junction of the foul mains from the two sides of the bench. No trouble whatever has been experienced with tar blockages; and the governors themselves require practically no attention.

Prior to their introduction, the hydraulic seal had an average depth of about 1½ inches, and the pull of the exhauster was kept as nearly as possible between 5-tenths and 10-tenths water gauge. It may here be worth while to remark that the liquor overflow arrangements are of such a type that whatever suction, etc., there may be in the hydraulic main, the same is also exerted at the point of overflow; no appreciable change in the depth of the seal could occur due to variation of such suction. The make of gas from April 1 to Sept. 1—that is, for the first 5 months of the working year now ended, and up till the introduction of the governors—was 11,527 cubic feet per ton, with an average quality of about 15.6 candles. When the governors were put in, the seal was reduced to about ¼ inch, and the pull on the hydraulic main was regulated to about 1-tenth or 2-tenths. The top line on Diagram No. 1 is an enlarged reproduction of a typical suction record for a period of 24 hours, made on the governor inlet. The lower and very irregular line shows the suction on the exhauster inlet recorded over the same period. It would not, perhaps, be fair to the exhauster governor to imply that it failed to prevent all the variations in suction here shown, because alterations were made in the weighting of same during the period over which the record was made. Temporary fluctuations, however, of as much as 1 inch may be seen which were in no way due to alteration of the weighting, and which the exhauster governor certainly did fail to prevent. At any rate, the two records together show how efficiently the retort house governors perform their function, and what an immense improvement in working they effect where the suction thrown by the exhauster is at all liable to fluctuation.

Suction Records on Hydraulic Main Retort House Governor Working.

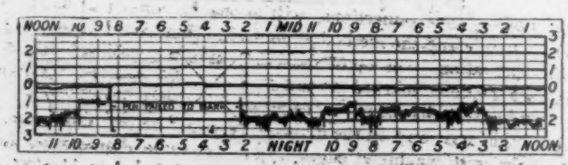


Diagram No. 1.—Stafford—Quarter Inch Seal. The Lower Line Shows the Suction on the Inlet Exhauster Recorded over same Period.

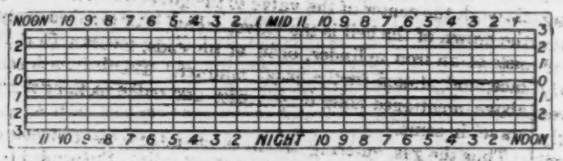


Diagram No. 2.—Longton—Dry Main.

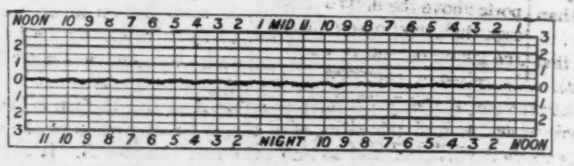


Diagram No. 3.—Longton—Liquid Flush with Bottoms of Dips.

Since the installation of the governors, the yield of gas has averaged well over 12,000 cubic feet per ton of coal, with a quality of 16.1 candles—an increase over the results for the preceding 5 months of the working year of over 500 cubic feet per ton and ½ candle in quality. Since the governors were installed, in addition to these gains in quantity and quality of gas, complete freedom from choked ascension pipes has been experienced, and practically no scurf produced; thus reducing the wear and tear of the retorts. The same kinds of coal have been used throughout the year.

By the kind permission of Mr. W. Langford, the Engineer and Manager of the Longton Corporation Gas and Electric Lighting Department, the author has been enabled to gather a few details in connection with the working of two retort house governors which are installed at the Longton gas works. They are 8-inch size, and are arranged one at either end of a bench of retorts containing 6 beds of 8 retorts each; the dimensions of the latter being 21 feet by 22 inches by 16 inches. One 8-inch governor was found to be of scarcely sufficient capacity to pass the maximum production of gas from this bench. The two foul mains are connected together at each end of the bench, and the two governors, mounted in each case just past the junction, are worked simultaneously, though either may be used alone. The governors were installed about 11 months ago. Previous to this, the depth of seal employed was about 2 inches and the suction thrown by the exhauster about 30-tenths to 35-tenths.

On first starting the governors, it was tried working them in conjunction with a dry hydraulic main; the governors being regulated to maintain a level gauge in same. Diagram No. 2 shows how well they did their work under these conditions. Very good results were obtained but difficulty was experienced by thick tar gradually depositing on the bottom of the hydraulic main in the form of pitch, which would not run off, but settled in a hard cake, and was very difficult to remove. It may be of interest to mention, in this connection, that the dip pipes enter the hydraulic main through the side, and at a downward angle. Working with a light seal was next tried; but it was soon found that the yield of gas dropped below what it had been with the dry main. At the same time, however, the objectionable pitching up of the hydraulic mains was cured and the tar from them run off without difficulty.

The liquor level was next adjusted, so as to bring it as nearly as possible about flush with the bottom of the dip pipes. These have now been the working conditions for some time and practically as good results are secured as were obtained with the dry mains. Diagram No. 3 made 2 or 3 months ago, when gas production was heaviest, illustrates the effect in the hydraulic main at that time of this method of working and is a typical example of the records then obtained. The reason that No. 3 record shows so much more fluctuation than No. 2 (which is practically a straight line) is attributed to the fact that, in the case of the former, the ends of the dip pipes were in contact with water while No. 3 was made while working with a dry main. It should be mentioned, however, that as the governors have now much less work to do then when the above records were made, they entirely prevent even the very slight fluctuation observable on No. 3, and lines are now obtained every bit as straight as No. 2.

An increase yield of gas of 300 cubic feet per ton, with a gain of about 1 candle in illuminating power, has been experienced at Longton since the governors were installed, and due to their introduction. It is found necessary at Longton to clean out the governor tanks and outlet chambers about every 3 months, as these become coated with tarry matter, which makes the governors liable to stick. No trouble has been experienced with regard to blockages.

A short time ago, one of the governor valves at Stafford was taken out for inspection after rather over 4 months' work, and was found, as might have been expected, covered with a thin coating of liquid tar. All the ports were, however, perfectly clear; and the whole valve, for all practical purposes, was quite clean. It may be mentioned that retort house governors are not invariably fixed on bye passes. One method of installing them consists in connecting the ends of two foul mains and mounting one one or more governors direct on the connecting piece. A short length of pipe from each instrument conducts the gas into the large outlet main which leads to the condensers, exhausters, etc.

The few remarks here put together concerning retort house governors and their working cannot pretend to contain any really new technical information; but it is hoped that they may, in the discussion be the means of eliciting, for the benefit of the Association, useful opinions from members who have had experience in such subjects as have been touched upon.

Dr. Pole's Formula.

By F. S. Cripps, Assoc. M. Inst. C.E., in *Journal of Gas Lighting.*

Dr. Pole's formula has held the field for many years as being, *par excellence*, the most reliable formula for solving all practical questions on the flow of gas, at low pressures, through pipes. It may not be perfect, it may not fit every case and condition; but for ordinary practical purposes it has proved satisfactory for gas engineers and managers during the past 54 years. Mr. Barlow founded his well-known tables on this formula; and these were further extended by Mr. Newbigging. The author's diagrams, issued in 1892, for graphically solving the various problems connected with the flow of gas, were based on Dr. Pole's formula. Mr. Wright's diagrams, which subsequently appeared in the *Gas World*, are also in agreement with it.

The formula in its original form is as follows:

$$Q = 1{,}350\, d^2 \sqrt{\frac{h\, d}{s\, l}}$$

and so it was left by Dr. Pole. By it, the volume of quantity of gas passed (Q) is assumed to be the unknown factor. But to render the formula more handy for immediate use in solving questions in which the other factors are the unknown quantities, Mr. Newbigging published two inversions of it, and also added three laws or axioms deduced from it. In 1892, the writer added to these, and published a summary in his work on "The Flow of Gas and Proportioning Gas Mains," p. 15.[1] This summary has recently been reproduced in the *Gas World* by Mr. Hole, in his articles on the "Distribution of Gas."

Below will be found not only a summary of all the formulæ and rules that have hitherto been published resulting from Dr. Pole's formula, but many more have been added, so as to render the series complete. The additions now made show at once the relations existing between the various factors.

Let Q = the discharge of gas in cubic feet per hour.
d = the diameter of pipe in inches.
p = pressure of gas in inches of water.
s = specific gravity of gas, air being 1.
l = length of pipe in yards.

Then $$Q = 1{,}350\, d^2 \sqrt{\frac{p\, d}{s\, l}}$$

$$d = \sqrt[5]{\frac{Q^2\, s\, l}{(1{,}350)^2\, p}}$$

$$p = \frac{Q^2\, s\, l}{(1{,}350)^2\, d^5}$$

$$l = \frac{(1{,}350)^2\, d^5\, p}{Q^2\, s}$$

$$s = \frac{(1{,}350)^2\, d^5\, p}{Q^2\, l}$$

From the above it is apparent that, other things being equal —

Q varies directly as $\sqrt{p}$	p varies directly as Q^2
" " $\sqrt{d^5}$	" " " l
" inversely " $\sqrt{l}$	" " " s
" " " $\sqrt{s}$	" inversely " d^5
d varies directly " $\sqrt[5]{Q^2}$	l varies directly " p
" " " $\sqrt[5]{l}$	" " " d^5
" " " $\sqrt[5]{s}$	" inversely " Q^2
" inversely " $\sqrt[5]{p}$	" " " s

s varies directly as p
" " " d^5
" inversely " Q^2
" " " l

A consideration of the foregoing gives rise to the following axioms or rules:

Quantity—Pressure.

(1.) Double the quantity requires 4 times the pressure.
Or, 4 times the pressure will pass double the quantity.
(2.) Half the quantity requires ¼ the pressure.
Or, ¼ the pressure is sufficient for ½ the quantity.

Quantity—Length.

(3.) Double the quantity can be discharged through ¼ the length.
Or, ¼ the length will allow of double the discharge.
(4.) Half the quantity can be discharged through 4 times the length.
Or, 4 times the length reduces the discharge one-half.

Quantity—Diameter.

(5.) Thirty-two times the quantity requires a pipe 4 times the diameter.
Or, a pipe 4 times the diameter will pass 32 times as much gas.
(6.) A pipe ½ the diameter will pass 1/32 of the quantity.
Or, 1/32 of the quantity can be passed by a pipe ½ the diameter.

Quantity—Specific Gravity.

(7.) The specific gravity stands in just the same relation to the vol- as the length does. (See axioms 3 and 4.)

1. "The Flow of Gas and Proportioning Gas Mains," by F. S. Cripps. London: Walter King, 11, Bolt Court, Fleet Street, E. C.

Pressure—Length.

(8.) If the pressure is doubled the length may be doubled.
And, conversely, if the length be doubled the pressure must be doubled.
(9.) If the pressure be halved the length may be halved.
From axioms 8 and 9 it is evident that—
(10.) The pressure required to pass a given quantity of gas varies exactly as the length of the pipe.

Pressure—Specific Gravity.

(11.) The pressure required to pass a given quantity of gas also varies exactly as the specific gravity of the gas. Hence if the specific gravity of the gas were doubled, double the pressure would be required.

Pressure—Diameter.

(12.) One thirty-second part of the pressure is sufficient if the diameter be doubled; or, in other words, if you double the diameter you only require 1/32 of the pressure to pass the same quantity of gas.
(13.) If you halve the diameter, 32 times the pressure is required.
And, conversely, if you increase the pressure 32 times, the diameter can be halved.

Length—Diameter.

(14.) The length can be increased 32 times if the diameter be doubled.
And, conversely, if the diameter is doubled, the length can be increased 32 times and pass the same quantity of gas.
(15.) If the diameter be halved the length must be reduced to 1-32d to pass the same quantity of gas.
And, conversely, if the length be made 1-32d of the distance, the diameter may be halved.

Specific Gravity—Length.

(16.) If the specific gravity be doubled, the length must be halved, and *vice versa*, to satisfy the equation.

Specific Gravity—Diameter.

(17.) The specific gravity follows the same laws as the length does in relation to the diameter.

It must be borne in mind, when using the above rules, that all other conditions remain the same when considering the effect of one factor on another in the different pairs.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MUCH to our surprise, we have the information that Mr. James Forbes, who since 1889 has capably acted as Superintendent of the Chattanooga (Tenn.) Gas Light Company, has resigned. His successor is Mr. Stanley J. Lowe.

THE increase asked for by the Lawrence (Mass.) Gas Company in its capital stock, has been recommended by the Legislative Committee that considered the matter.

MR. J. G. OLIGER is authority for the statement that $50,000 will be expended this season in betterments on the plant of the Cleburne (Tex.) Gas and Electric Company.

MR. EDMUND H. MCCULLOUGH, as President of the Manor Gas Coal Company, has notified the holders of the first mortgage bonds that the Company has elected to pay off the entire mortgage on the 1st prox., at which time, according to the terms, the interest will cease. Payments of principal and interest will be made in Philadelphia at the Bank of North America.

A CORRESPONDENT in San Francisco, Cal., writing under date of the 7th inst., incloses the following: "With the retirement of Allan Pollok as General Manager of the San Francisco Gas and Electric Light Company and the enthronement of Mr. John A. Britton, there has been a severe shakeup in the general office, and two heads of prominence have been removed. The two officials who have been called upon to resign were Mr. J. M. Earsman, Superintendent of the general office, and Charles Hunt, Manager of the stove department.

Their resignations were called for and promptly handed in. This sudden upheaval has made many of the older officials quake in their shoes lest they be handed a note also informing them that their services are no longer required. The position of General Manager of the office, which was held by Earsman, has been consolidated with that of the Secretary and Treasurer, which has been filled for so many years by Mr. Charles L. Barrett. Mr. Samuel P. Hamilton who was in charge of the complaint and advertising department, has been placed also in charge of the stove department."

THE new selling rate at Cohoes, N. Y., from $1.50 to $1.35 per 1,000 cubic feet, became effective the 1st inst.

UNDER the terms of the franchise granted to J. A. Weber, of Vancouver, Wash., for the operation of a gas plant there, it is stipulated that construction work must be commenced within 6 months and must be completed within a year. The maximum selling rate for the first 15 years is put at $1.80 per 1,000 cubic feet after which it may not exceed $1.35.

MR. R. A. WALLACE has resigned from the Superintendency of the Hamilton (Can.) Gas Company to assume the duties of Superintendent and Engineer of the Quebec Gas Company.

MR. HORACE S. TAYLOR has been appointed Engineer to the Citizens Gas Light Company, of Quincy, Mass.

GAS coke is readily sold by the Milwaukee (Wis.) Gas Company at $4.50 to $5 per short ton.

MR. DONALD MCDONALD, President of the Kentucky Heating Company, writing to us under date of the 16th inst., says:

To the Editors AMERICAN GAS LIGHT JOURNAL: Someone calling himself W. C. Doyle, is travelling over the Western country, representing himself to be an employee of the Kentucky Heating Company, of Louisville, and cashing checks at various hotels. We know nothing about the man. We believe him to be an arrant swindler, and the checks he has presented are, as far as we know, forgeries. Will you kindly publish this letter, as he may attempt to victimize some of our friends in the gas business.

DR. G. G. REVAY, of New York, a well-known fuel specialist, and an authority on modern coke oven practice, sailed last Tuesday on the steamship Kaiser Wilhelm for Europe. Several members of the staff of the United States Steel Corporation accompany him for the purpose of inspecting different plants in connection with various extensive projects now under consideration with its many works. It is said that the Doctor, who is an expert on the subject of by-product coking, is also interested in several branches of chemical manufacture, and intends to investigate some new electrolytical processes, which it is said will be established in America under most advantageous conditions, and for which purpose negotiations for large volumes of cheap water power are being carried on by influential parties. The Doctor, as likely will be remembered, visited Europe last fall with Mr. Charles M. Schwab and some of his engineers to visit certain important European works and on his return worked out extensive plans for the Bethlehem (Pa.) Steel Corporation.

THE Noblesville (Ind.) Gas and Improvement Company, as a distributer of natural gas, is showing an aggressive and progressive spirit in the putting out of ranges and the like. Write to it for a plan as to its ways of doing the work. Some of them are unique.

MR. THOMAS JOYCE has resigned his position with the Rockville (Conn.) Gas and Electric Company in order to take an important place on the staff of the New Britain (Conn.) Gas Company.

A CORRESPONDENT in Indianapolis, Ind., writing under date of the 14th inst., says: "At the annual meeting of the Muncie (Ind.) Heat, Light and Power Company, the officers elected were: President, H. C. Ziegler; Treasurer, George J. Warrott.

THE Mauch Chunk (Pa.) Gas Company, through its Superintendent, Mr. L. N. Lincoln, recently issued the following notice: "The Mauch Chunk Gas Company begs to announce a reduction in the price of gas, to take effect April 1st, 1906. After that date the gross price per 1,000 cubic feet of gas will be $1.70, subject to a discount of 20 cents per 1,000 cubic feet, if paid on or before the 15th day of the month, thus making the net price $1.50 per 1,000 cubic feet. The fixed charge per consumer, irrespective of the amount of gas consumed per month, will be 30 cents per month. This fixed charge is made to take care of the expense incurred by the Company in the care of each consumer whether he burns 100 or 100,000 cubic feet of gas per year. In the absence of any such charge the small consumer is served at an actual loss to the Company and this loss must be made up from the profits derived from the large consumers. When each consumer pays his share of the distribution expenses, reading meters, collections, repairs to services and meters, etc., the price per 1,000 cubic feet can be reduced, and it is by virtue of this fixed charge that we are enabled to make the present reduction, which to a large percentage of our consumers, is a material one. Take, for instance, the consumer with an average consumption of 1,000 cubic feet per month, or 12,000 cubic feet per year. Under the old rate the net cost would have been $23.40, under the new rate, $21.60, a saving of $1.80, or a net reduction of 15 cents per 1,000 cubic feet. To the consumer using 2,000 cubic feet per month, or 24,000 cubic feet per year, the saving is $4.20, or a reduction of 19 cents per 1,000 cubic feet. Thus it may be seen that as the consumption increases the rate per 100 cubic feet is automatically reduced. It is the intention of the Company to reduce the price of gas as soon as the sales warrant such action. Remember that we make no charge for any reasonable repairs and will consider it a favor if you will report at the gas office any cause for dissatisfaction that you may have."

THE Philadelphia *Ledger*, says that, on the 10th inst., Judge Wiltbank rendered an opinion in a Court of Common Pleas, Philadelphia, dismissing an equity suit instituted more than a year ago by Maurice L. Bowers and others, contesting the right of the United Gas Improvement Company to impose penalties on consumers who do not pay their bills within 5 days. Daniel R. Rothermel and Walter B. Saul, counsel for the complainants, said that they would carry the case to the Supreme Court. The complainants sought to recover amounts collected from them in fines and interest since 1897, when the Company gained control of the gas works. The main contention was that the city, in transferring the lease, went beyond its legal power in giving to the United Gas Improvement Company the right to penalize its customers. This right, it was urged, belongs only to legislative bodies and, therefore, cannot be transferred to a private corporation. The Judge in dismissing the suit, said: "The United Gas Improvement Company possesses franchises duly conferred by its charter, and as a business agency it has the power to transact business as an individual might, save as restricted by its articles of incorporation. It may, therefore, in operating its plant and furnishing citizens with illuminating gas, prescribe rules, regulations and conditions, not only for the manufacture of its product, but also for the sale of it to the public at large. In taking the leasehold of the property from the city it stipulated not to prescribe certain rules. With respect to them, therefore, as well as to rules exceeding its charter limitations, it must be held incapable of enforcing them. The rule or regulation complained of by the plaintiffs, if not of this prohibitory character and if such as an ordinary trading concern might adopt, must be respected unless it is against public policy. The regulation or stipulation to the effect that a failure to pay for the consumption of gas, at a time named, and after notice provided for, must result in one or two consequences, either in the shutting off of the supply from the premises of the debtor or in his payment of 3 per cent. as compensation for his delinquency, is one that, as a trading concern, the defendant might insist upon, independently of any terms of the grant by the city to it. Whether or not it is regarded as derived from the municipal authority, it is valid and effective by the light of the decisions of the Supreme Court upon the judicial investigation by that court of the powers of the city in supplying gas to its inhabitants from the year 1838 to the time of the creation of the trustees of the city gas works and thence to the time of the contract of the city with the defendant company. By non-payment at the maturity of his account, each of the plaintiffs became one of a class who had knowingly exposed themselves to a consequence with which they were familiar and which they had deliberately invoked by the terms procuring the gas for them. No discrimination was made against him as an individual, nor did any action of the defendant procure a discrimination against him as one of the class. By his failure to pay at the date he had stipulated for, and by permitting the lapse of the interval of grace allowed him, he ranged himself in the company of delinquents. No one placed him there but himself. And he agreed to stand there in the contingency which he later created."

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Sieg, 30 Lime Street, London.

MONDAY, APRIL 23, 1906.

The Market for Gas Securities.

The condition of the market for New York gas shares remains virtually unchanged at the close of the week (Friday), although between times much weakness was displayed. It looks to us now that the weak ones—and they constituted some of the best intrenched estates of the city—have given it up, but there is no doubt that stronger ones follow them. Keep your stock.

Brooklyn Union can and should have a similar argument applied to it. The appalling trouble in San Francisco cannot now even be guessed at. Our information, which came by way of Oakland at noon of to-day, is to the effect that the gas and electric plants there were to all intents and purposes destroyed. Let us hope that our informant was wrong. The general gas share market is strong.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

APRIL 23.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	139¼	139¾
Central Union, Bonds, 5's	3,000,000	1,000	108	110
Equitable Bonds, 6's	1,000,000	1,000	..	105
" 1st Con. 5's	2,300,000	1 000	118	120
Mutual	3,500,000	100	255	270
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	105	107
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	98	104
Northern Union Bonds, 5's.	1,250,000	1,000	106	107
New York and East River .. Bonds 1st 5's	3,500,000	1,000	108	111
" 1st Con. 5's	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
Bonds, 1st Mortgage, 5's	1,500,000	1,000	111	114
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	123	126
" " Bonds (5's)	15 000,000	1,000	112	113
Bay State	50,000,000	50	5/16	¾
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guarantee 1 Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	104⅛	104¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,683,750	100	..	95
Preferred	3,026,500	100	107¾	108
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	85	..
Mortgage, 6's	3,500,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98¾	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
For Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104¼	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	107¼	106¼
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	.	105
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	215	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	127	128
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	92¾	93
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	00	.	..
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¾	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	3,600,000	20	305	305½
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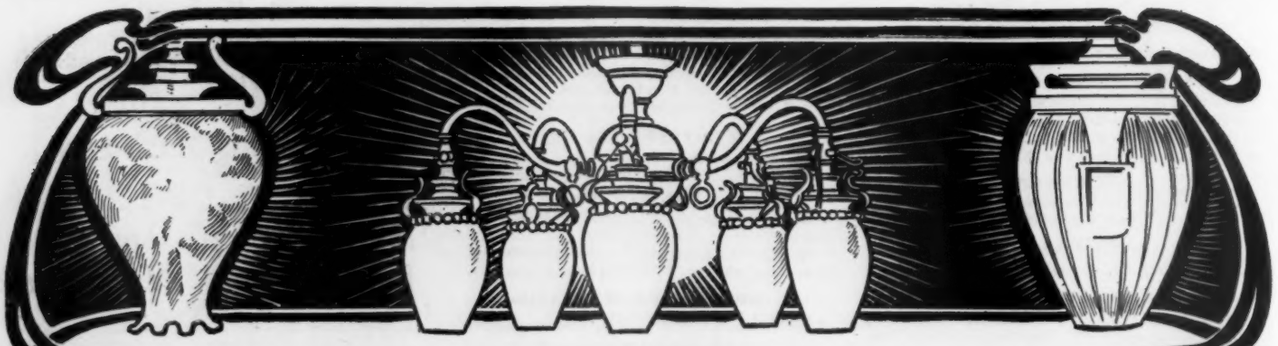

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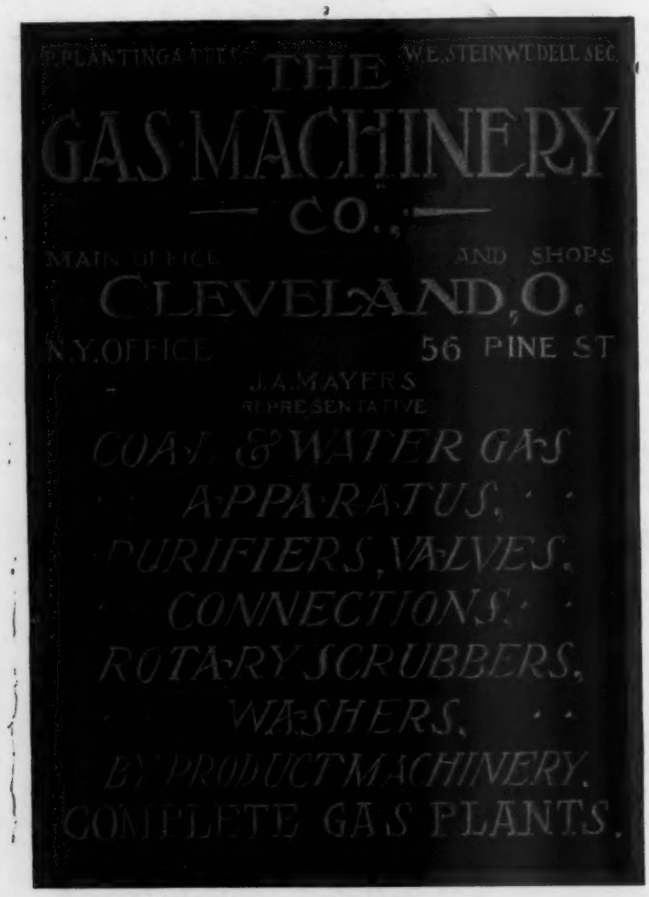

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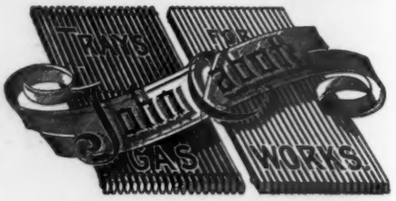

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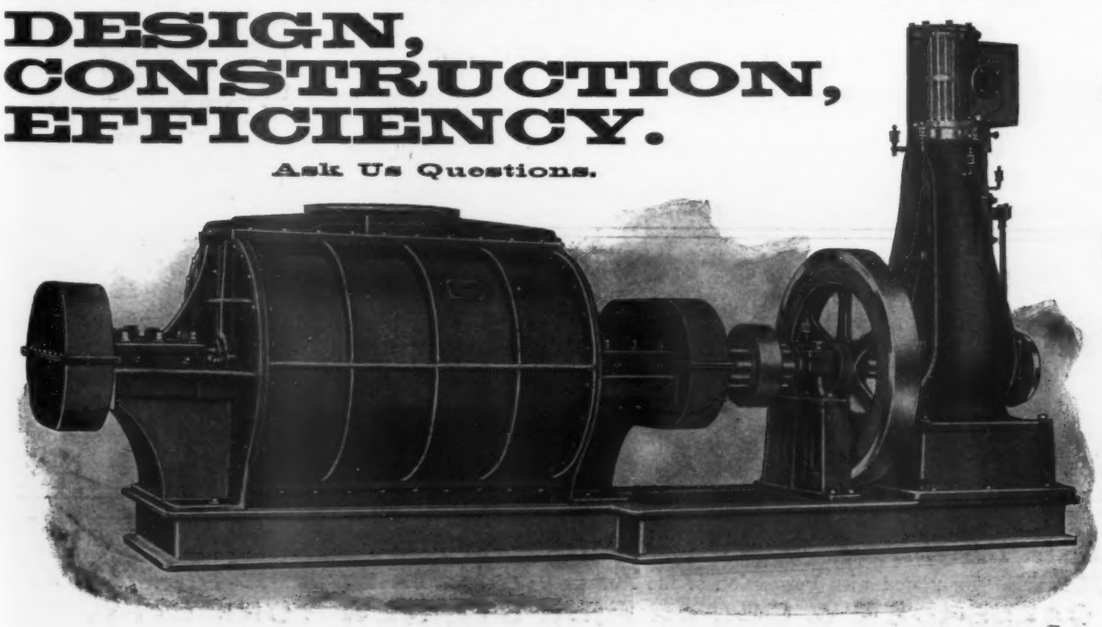

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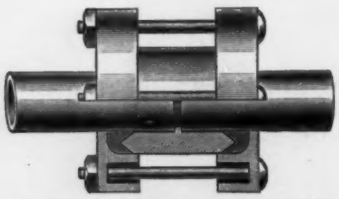

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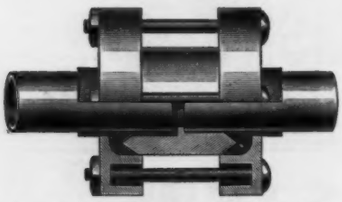

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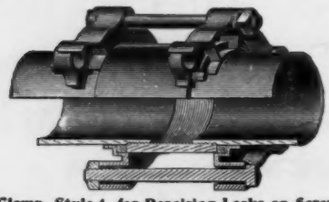

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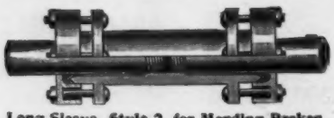

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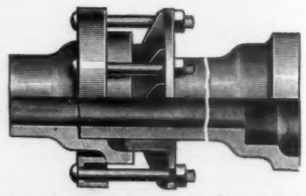

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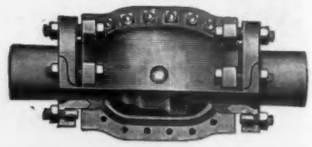

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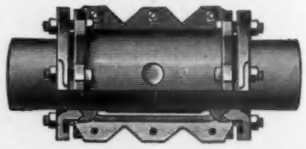

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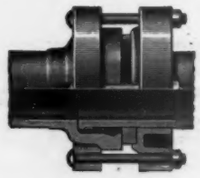

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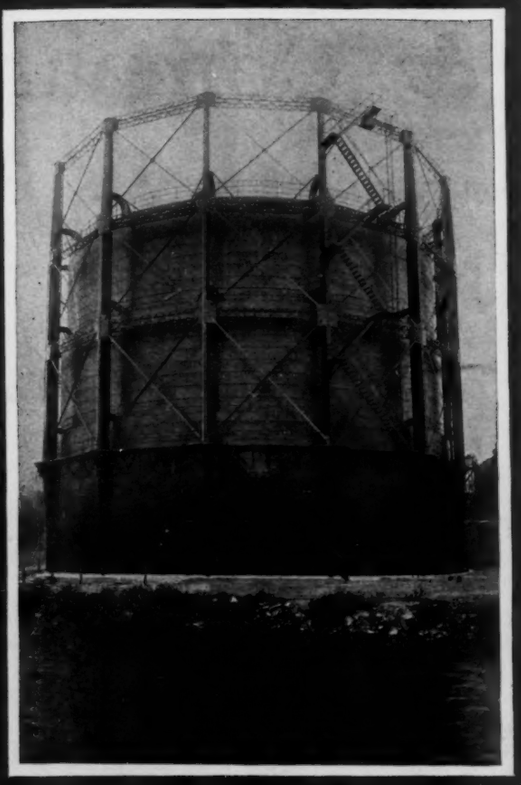

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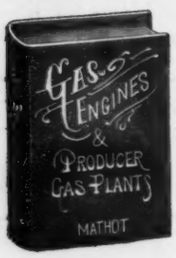

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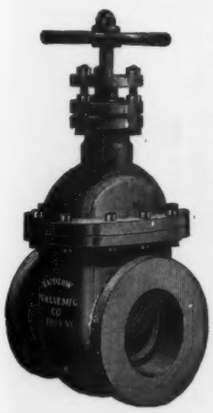

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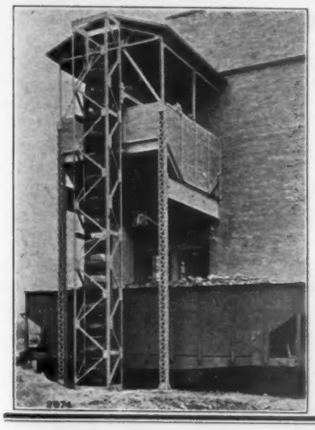

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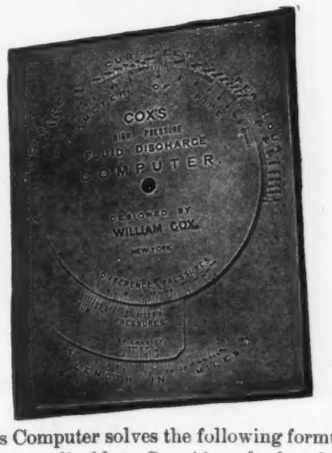

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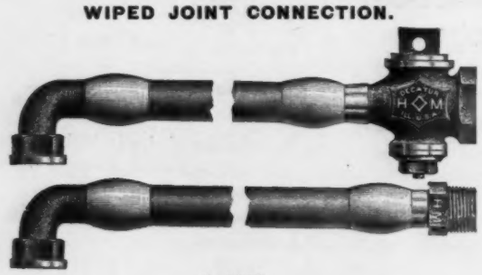

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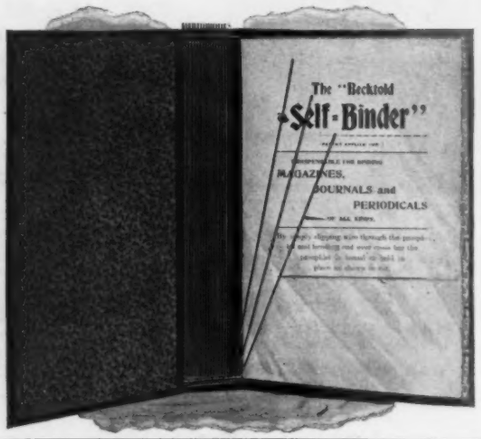

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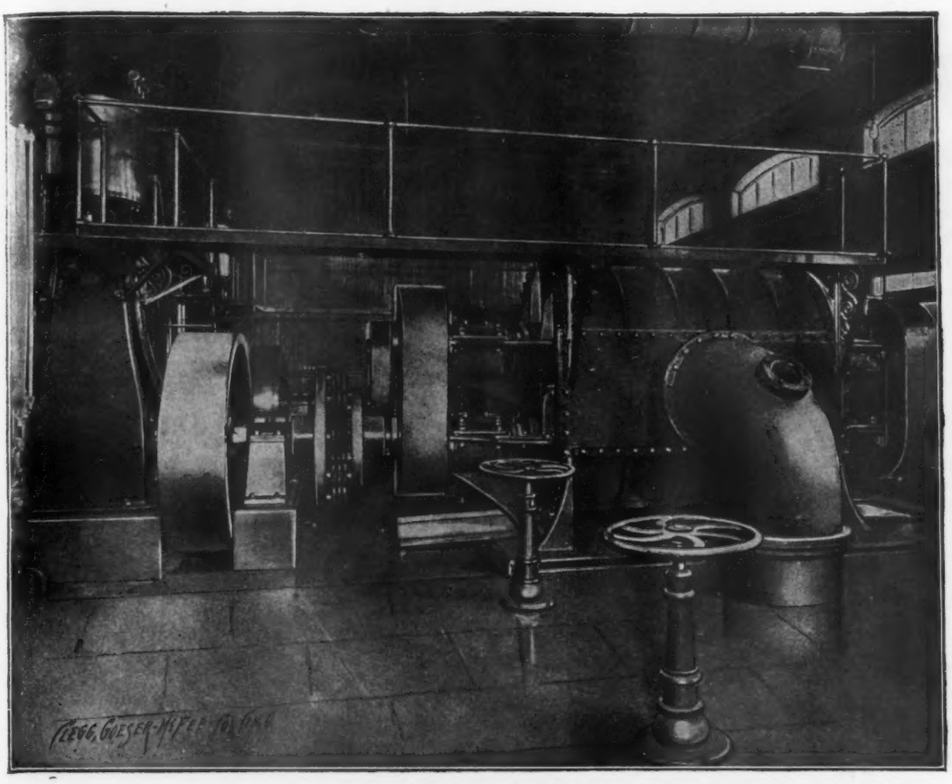

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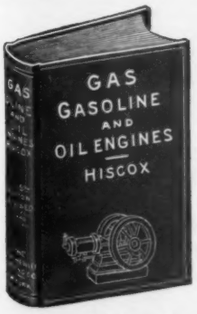

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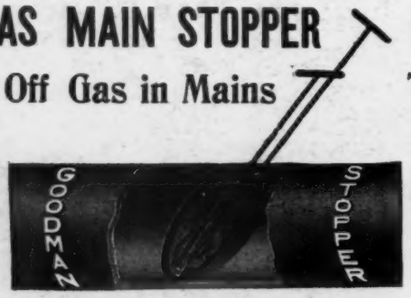
Established 1856. Works at Phillipsburgh, N. J.
New York Office, 160 Broadway.

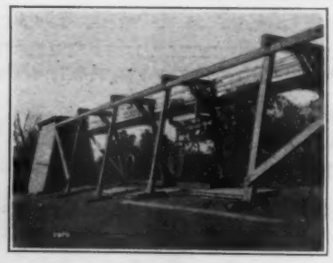
CAST IRON WATER AND GAS PIPE,
FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF
Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

SAFETY GAS MAIN STOPPER COMPANY,
For Shutting Off Gas in Mains
Any size gas main can be shut off in 30 seconds. : : :



Temporarily during alterations and repairs. : : : :
STOPPERS SENT ON TRIAL.
Address: SAFETY GAS MAIN STOPPER CO., 552 E. 135th St., New York City.

TELPHER
Installed for Jacksonville (Ill.) Gas Light and Power Company.



Telpher travels with coal-filled bucket from storage bin to boiler room, where it is automatically dumped. Then reversing itself, it returns with empty bucket for another load.
Conveying speed is 250 feet a minute and the hoisting capacity one ton at 60 feet a minute.
All kinds of materials can be transported by Telpherage.
Write for Booklet 53.
UNITED TELPHERAGE DEPARTMENT
The Dodge Coal Storage Co.
Philadelphia—Hunting Park ave. and P. & R. Ry.
New York—49 Dey street.
Boston—164 Federal street.
Chicago—39th street and Stewart avenue.
Pittsburgh—1501-2 Park Building.
Portland, Ore.—309 McKay Building.

Chollar's System of Gas Purification.
THE PURIFIED GAS REVIVES THE FOULED OXIDE.

Four Roll Troughing Idler
FOR WIDE BELTS.
The positions of the rolls conform to a natural and uniform curve of the belt.

BELT CONVEYORS
EQUIPPED WITH
BALL BEARING ROLLS
Possess greater efficiency, consume less power, and the belts last much longer than when any other type of roll is employed.
Permit us to tel you why and to submit plans and estimates.
The Link-Belt Machinery Co.
Link-Belt Engineering Co. Philadelphia Chicago U.S.A.

AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

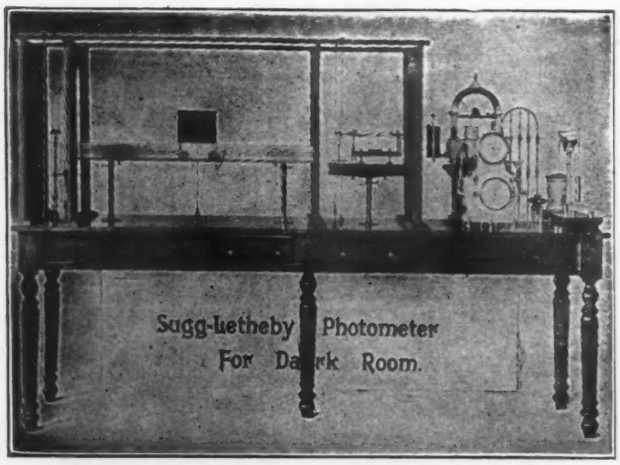
MAY, 1906.

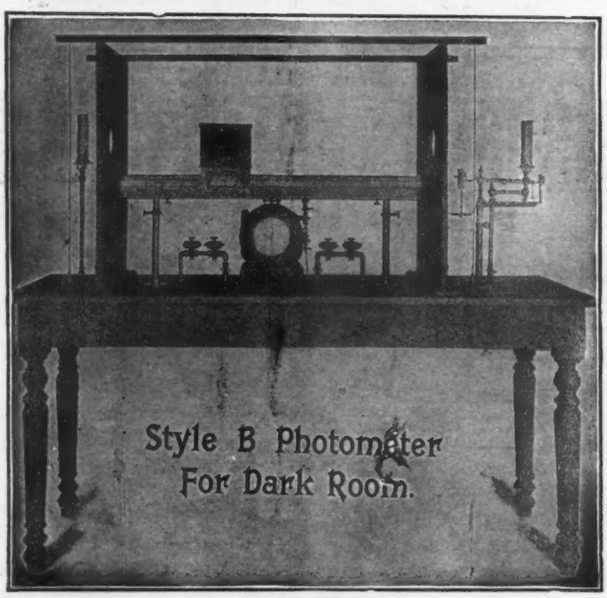
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Tue.	1	12.30 AM FQ	4.00 AM
Wed.	2	1.10	4 00
Thu.	3	1.50	4.00
Fri.	4	2.20	4.00
Sat.	5	3.00	4.00
Sun.	6	3.30	3.50
Mon.	7	No L.	No L.
Tue.	8	No L. FM	No L.
Wed.	9	No L.	No L.
Thu.	10	7.30 PM	10.40 PM
Fri.	11	7.30	11.40
Sat.	12	7.20	12.40 AM
Sun.	13	7.40	1.20
Mon.	14	7.40 LQ	2.00
Tue.	15	7.40	2.40
Wed.	16	7.40	3.10
Thu.	17	7.40	3.40
Fri.	18	7.40	3.40
Sat.	19	7.40	3.40
Sun	20	7.40	3.40
Mon.	21	7.40	3.40
Tue.	22	7.40 NM	3.40
Wed.	23	7.40	3.40
Thu.	24	7.40	3.40
Fri.	25	7.40	3.40
Sat.	26	7.40	3.40
Sun.	27	9.50	3.30
Mon.	28	10.30	3.30
Tue.	29	11.10	3.30
Wed.	30	11.50 FQ	3.30
Thu.	31	12.20 AM	3.30

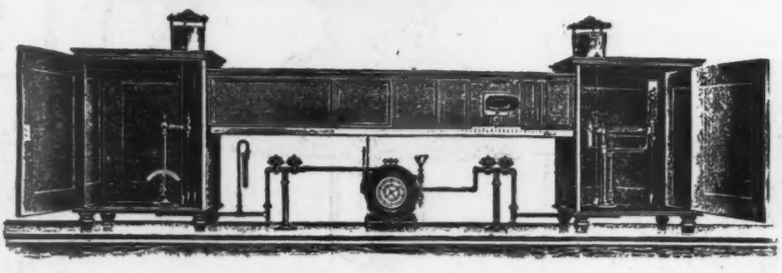
TOTAL HOURS DURING 1906.

By Table No. 1.

	Hrs.Min.
January	223.40
February	190.40
March	192.10
April	167.00
May	152.20
June	142.10
July	150.20
August	157.40
September	170.00
October	185.10
November	201.40
December	214.00
Total, yr.	2146.50







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

MAY, 1906.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light	Extinguish.
		P. M.	A.M.
Tue.	1	6.45	4.00
Wed.	2	6.45	4.00
Thu.	3	6.45	4.00
Fri.	4	6.45	4.00
Sat.	5	6.45	4.00
Sun.	6	6.45	4.00
Mon.	7	6.55	3.40
Tue.	8	6.55	3.40
Wed.	9	6.55	3.40
Thu.	10	6.55	3.40
Fri.	11	6.55	3.40
Sat.	12	6.55	3.40
Sun.	13	6 55	3.40
Mon.	14	7.00	3.30
Tue.	15	7.00	3.30
Wed.	16	7.00	3.30
Thu.	17	7.00	3.30
Fri.	18	7.00	3.30
Sat.	19	7.00	3.30
Sun.	20	7.00	3.30
Mon.	21	7.10	3.15
Tue.	22	7.10	3.15
Wed.	23	7.10	3.15
Thu.	24	7.10	3.15
Fri.	25	7.10	3.15
Sat.	26	7.10	3.15
Sun.	27	7.10	3.15
Mon.	28	7.15	3.15
Tue.	29	7.15	3.15
Wed.	30	7.15	3.15
Thu.	31	7.15	3.15

TOTAL HOURS DURING 1906.

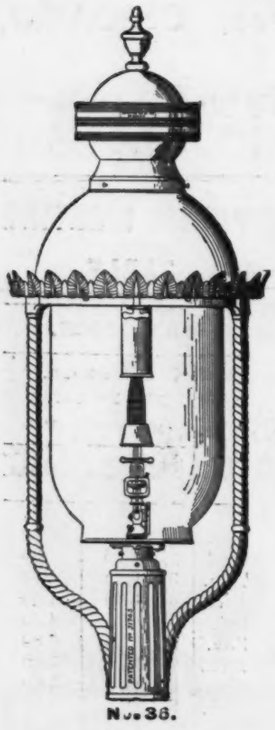
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

The Welsbach No. 6 Harp Fixture.

AN IDEAL LIGHT FOR DINING OR LIVING ROOMS.

THE HIGHEST MECHANICAL INGENUITY COMBINED WITH ORNAMENTAL BEAUTY--THE NEWEST OUTPUT FROM THE WELSBACH FACTORIES.

Equipped with new model No. 66 high candle power Welsbach Burner.

Side Pilot By-pass Tube covered with refractory sleeve to prevent bending.

Fourteen-inch Opal Dome Shade.

Polished Brass Embossed Crown 2¼ inches high.

Length of Fixture, 30 inches.

Width of Harp, 4½ inches.

Finished in Polished Brass.

Packed One Dozen to the Case.

List Price, per Dozen, $45 00.

We recommend equipping the No. 6 Harp Fixture with No. 4197 Intensive Brand Mantle, and the No. 306 **F. Q. M.** Clear Glass Air-Hole Cylinder.

Although the 14-inch Opal Dome Shade is standard equipment, we are prepared to furnish Dome Shades in green, pink or yellow (opal lined), and will be glad to quote prices.

WELSBACH CO.,

Salesrooms in all the principal cities of the United States.

Factories:
GLOUCESTER, N. J.
CHICAGO, ILL.

THE UNITED GAS IMPROVEMENT COMPANY

For the Year Ending December 31st, 1905, has been Awarded Contracts for 40 Sets of

Standard Double-Superheater Lowe Water Gas Apparatus.

PARTIAL LIST OF PLACES:

Catasauqua, Pa.
Plattsmouth, Neb.
Detroit, Mich. (2d contract).
Springfield, Ills.
Oneonta, N. Y. (2d contract).
Pottsville, Pa. (2d contract).
Evansville, Ind. (2d contract).
Lansdale, Pa.
Hempstead, N. Y. (2d contract).
New Britain, Conn.
New York, Mutual Co. (3d contract)
St. Louis, Mo. (4th contract).
Sioux City, Ia. (3d contract).
Amsterdam, N. Y.
Houston, Tex. (2d contract).
Hamilton, O. (2d contract).
Indianapolis, Ind. (2d contract).
Nanticoke, Pa.
Hazleton, Pa.
Mahanoy City, Pa.
Ludington, Mich.
Ossining, N. Y.
Lancaster, Pa.
Flushing, N. Y. (2d contract).
South Bend, Ind.
Fall River, Mass. (2d contract).
Minneapolis, Minn. (2d contract).

TOTAL SETS TO DECEMBER 31, 1905, ... 593
TOTAL DAILY CAPACITY TO DECEMBER 31, 1905, 463,780,000 CU. FT.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

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CLAY GAS RETORTS, FIRE CLAY TILES, FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING ENERATOR GAS FURNACE

Brooklyn Fire Brick Works,

OFFICE AND WORKS:
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ST. LOUIS GAS CONSTRUCTION CO.,

DESIGNERS AND BUILDERS OF

COAL GAS BENCHES,

SPECIAL HIGH GRADE REFRACTORY MATERIAL FOR BENCH SETTINGS AND WATER GAS LININGS.

SOLE AGENTS FOR

CHRISTY SETTINGS.

CORRESPONDENCE SOLICITED.

ST. LOUIS, MO.

STANLEY'S CELEBRATED FIRE CEMENT

For the Repair of Clay and Iron Retorts & Firebrick Work, for the Protection of Ironwork when Exposed to a High Degree of Heat, and Excellent for Mouthpiece Joints.

In General Use in the United States and Canada.
Unlike Expensive Preparations,
THERE IS ABSOLUTELY NO WASTE.

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150 Nassau St., New York, N. Y.

ALBERT J. WEBER, President and General Manager.

Established 1846.

Adam Weber Sons.

Manhattan Fire Brick and Enameled Fire Clay Retort Works.

Works at Weber, on the Raritan River. Middlesex County, New Jersey.

GENERAL OFFICES:
Park Row Building, New York City.

Modern Coal Gas Benches,

With either Horizontal or Inclined Retorts, Half-Depth and Full-Depth Recuperative Furnaces.

ADAM WEBER PATENTS

STANDARD BENCH IRONWORK.

Linings for Water Gas Apparatus, High Grade Fire Brick of All Shapes and Sizes, Ground Fire Clay, Ground Fire Brick in Bulk or in Barrels.

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Works,
LOCKPORT STATION, PA.

ESTABLISHED 1864.

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Successor to WILLIAM GARDNER & SON.

PETER YOUNG, Secretary and Treas.

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PITTSBURGH, PA.

Fire Clay Goods for Gas Works.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT.

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. PITTSBURGH, PA.
In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD,
1200 Bank for Savings Bldg., Pittsburgh, Pa.

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MANUFACTURERS OF

Fire Brick, Tiles, Special Shapes, etc.

NEW YORK OFFICE:
17 Battery Place, New York.

WORKS:
South River, N. J.

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BALTIMORE RETORT & FIREBRICK CO.

BALTIMORE, MD.,

Manufacturers of all Material for the Construction of Coal Gas Benches.

HALF AND FULL DEPTH AND FREE FIRING BENCHES,

All styles of which we have in operation, equipped with the BEST of LATEST IMPROVEMENTS, proving our claim for SUPERIOR QUALITY and EFFICIENCY.

INCLINES—We have in SUCCESSFUL OPERATION benches of Inclined Retorts, MANUFACTURED and ERECTED by us.

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Agents for New England States.

LARGE FACILITIES—Correspondence Solicited.
RAIL and WATER CONNECTIONS to ALL POINTS.

JOHN DELL,
President and General Manager.

MISSOURI FIRE BRICK CO.,

ESTABLISHED 1882.

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Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are the **Exclusive Agents** *for the* **Mitchell Patent Benches,** *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* **Rear Clinkering.** *The* **Mitchell** *is the* **Original Coal Firing Bench.** *We also Erect Plain Benches with* **One** *to* **Six Retorts.**

YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.

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Bronder Patent Stoking Machinery.

Three-Scoop and Three-Rake Charging and Discharging Machines are operating in New York, Newark, N. J., Philadelphia, Worcester, Mass., Mt. Vernon, N. Y., Toronto and Montreal, Canada.

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These are the only machines that will draw or charge simultaneously 3 or 4 retorts (vertically) and handle from 42 to 60 retorts in from 25 to 30 minutes, lid opening and closing and filling of furnaces included.

Hot Coke Conveyor, Quencher and Steam Exhauster, operating in Toronto, Canada, working in water-sealed flue, rollers being protected from heat and grit.

COAL CRUSHERS, CONVEYORS AND BINS. TURNTABLES FOR MACHINES.

Labor-Saving Machines for Handling Coal and Coke from Coal Cars to Coke Yard or Bins, a Specialty.

G. A. BRONDER,

Contracting Engineer and Builder,

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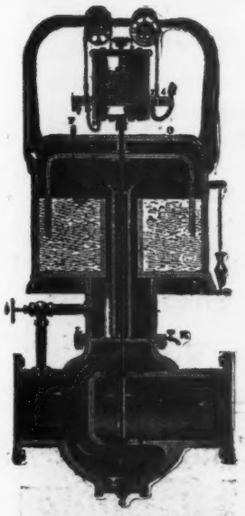

Design, Construction and Extension of

COAL OR WATER GAS PLANTS,

Automatic, Balance, High Pressure and Service Governors,

Roots Improved Gas Exhausters,

Iron Sponge, Purifying Material for Gas Purification, Jones Jet Photometers, Pressure Registers, etc.,

INSTALLATION OF SMOKELESS TAR BURNING SYSTEM.

Reinforced Concrete Construction for all Purposes,

Wide Experience in High Pressure Installation and Extension,

GAS SPECIALTIES.

395 Broadway, NEW YORK.

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OF ST. LOUIS, MO.,

PROPRIETORS OF THE

OAK HILL GAS RETORT AND FIREBRICK WORKS.

ST. LOUIS OFFICE: 417 Pine Street. NEW YORK OFFICE: Aldrich Court, 45 Broadway.

WE MAKE A SPECIALTY OF WATER GAS LININGS AND CHECKER BRICK.

Half and Full Depth Benches of Our Own Design, Containing 6, 8 or 9 Retorts.

SLOPERS.—We have perfected plans of INCLINED RETORT BENCHES, designed to meet conditions prevailing in America, and constructed entirely of American materials.

We Build Benches Complete. Ready for Gas Making. Also,

RETORT HOUSES,

COAL and COKE CONVEYING MACHINERY.

Plans, Specifications and Estimates Cheerfully Furnished.

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ALL CONTRACTS MADE AS OF ST. LOUIS, MO.

Gold Medals awarded by the Louisiana Purchase Exposition at St. Louis, for fireclay gas retorts, gas retort benches, firebrick and setting tiles.

Newbigging's Handbook for Gas Engineers and Managers. Price, $6.50. For Sale by A. M. Callender & Co., 42 Pine St, N. Y. City.

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Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
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STRICTLY High Grade. . . . .
Carefully Prepared.
For Gas Making or
Heavy Steaming.

A. C. M. AZOY, General Agent, 1 Broadway, New York.

THE JEFFREY SYSTEM
OF COAL AND ASH HANDLING IS
RAPIDLY SUPPLANTING OLD-TIME METHODS.

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BUCKET CONVEYOR
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TRAVELING CHUTE for
FEEDING STOKERS are
FEATURES of this POWER HOUSE EQUIPMENT.

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Inclined Benches, own system, Recuperative Furnaces, Exhausters, Exhauster Governors, Condensers, Washers, Coolers, Wet Purifying Plants, Purifiers, Oxide Elevators, Hydraulic and Dry Coke Conveyors.
Special High Grade Material for Recuperative Furnaces.
ees for ARROLL-FOULIS Charging and Discharging Machines and FRONHAUSER Coke Conveyors. OFFICE, 405 KEENE ST. MILWAUKEE, WIS.

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Strong, Simple, Durable. Will Crush any Size Desired.
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COMPLETE GAS WORKS ERECTED.
Artificial and Natural Gas Mains Furnished and Laid.
GAS PROPERTIES PURCHASED.
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WATKINS (SENECA LAKE), N. Y.

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PRODUCER, REFINER, SHIPPER AND EXPORTER OF
Petroleum and All Its Products.
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THE SUN OIL CO.
Gas Oil, Gas Naphtha,
Refined Oil, Lubricating Oils.
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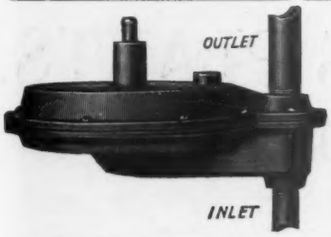

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Our Governors Reduce 30 or 40 Pounds Pressure to 2 Inches Water Pressure.
WE MAKE ALL SIZES OF
DOUBLE DISTRICT GOVERNORS, INDIVIDUAL HOUSE SERVICE AND LOW PRESSURE GOVERNORS.
Write for Catalogue and State what you Need.
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PRACTICAL HANDBOOK ON
GAS ENGINES,
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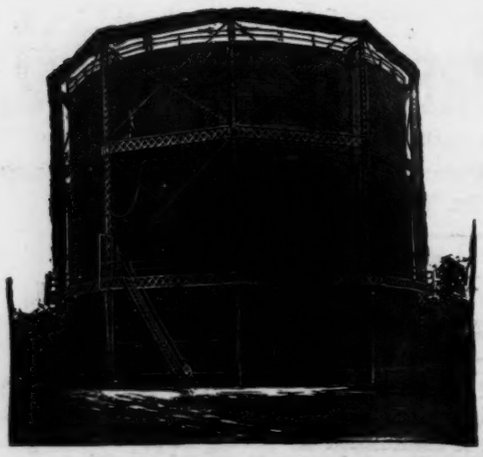
Translated with Permission of the Author, GEO. M. RICHMOND, M.E.
PRICE, $1.00.
A. M. CALLENDER & CO., 42 Pine Street, New York City.



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Principal Office and Works, Waltham, Mass.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

Coke Barrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

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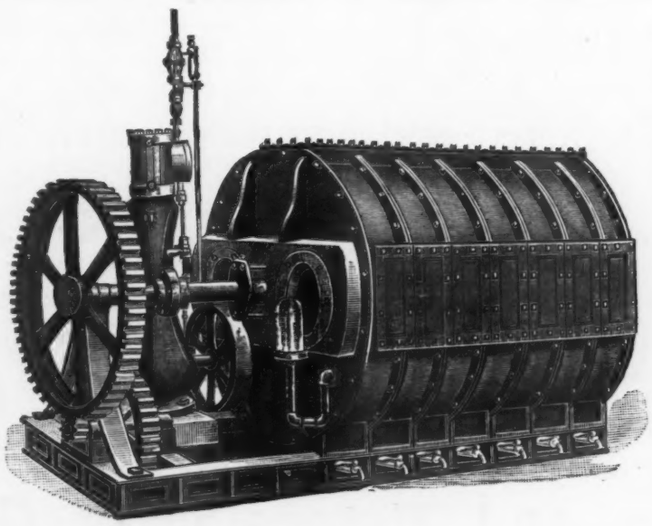

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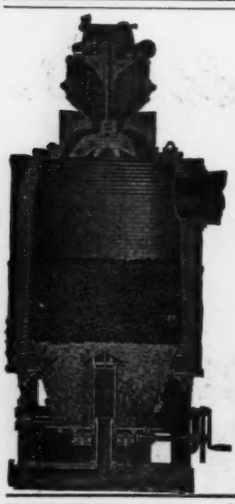

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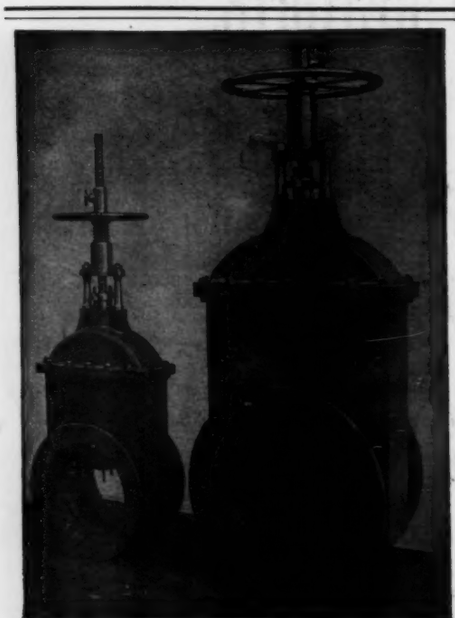

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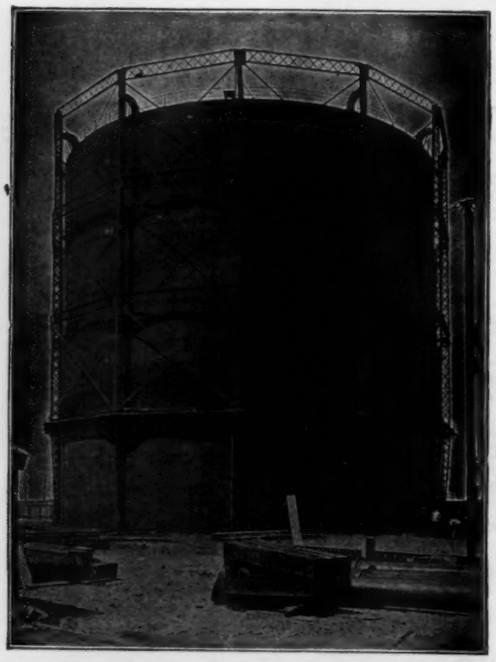

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I note that most of these extracts are broad and safe-guiding precepts, which apply with equal force to one Company as to another. The 13 years' existence of the Board of Gas Commissioners, with its unusual opportunities for acquiring information, have justly made it a high and safe authority in all matters pertaining to the management, obligations and rights of Gas Companies. Your little book will serve as a valuable reference library in settling legal complications which often arise between a Gas Company and its customers.

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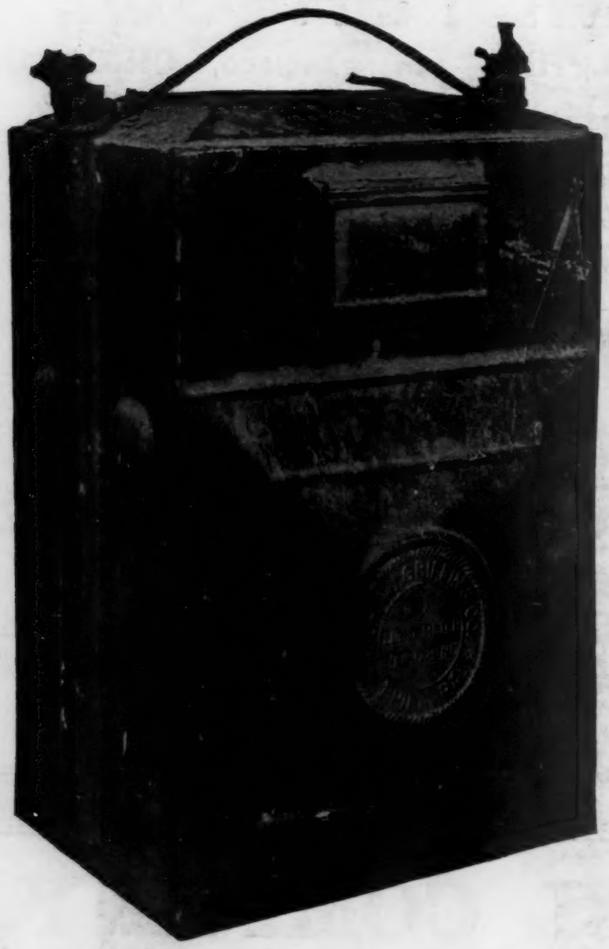

This is a photograph of a 3-light regular meter out of a lot of meters received from the Coatesville Gas Co., Coatesville, Pa., to be repaired and converted into prepayment meters.

AFTER.

This is the same meter after it has been repaired and converted into a new prepayment meter.

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